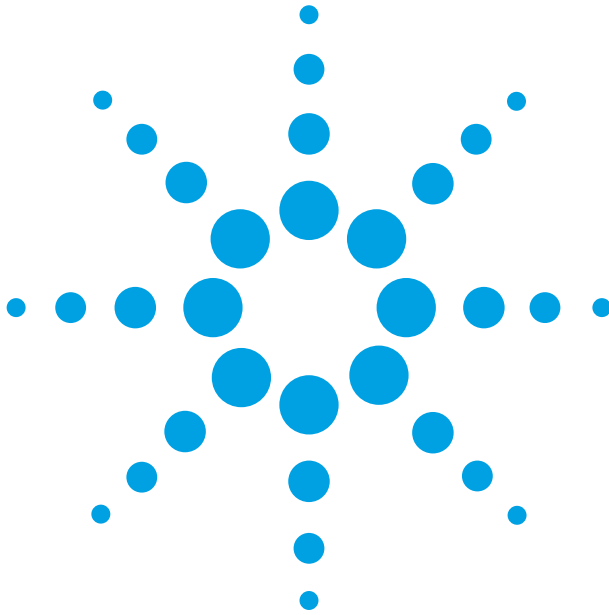


**Agilent Technologies N1655B
Service Advisor
Dual DS3/1, E3/1 Test Module**

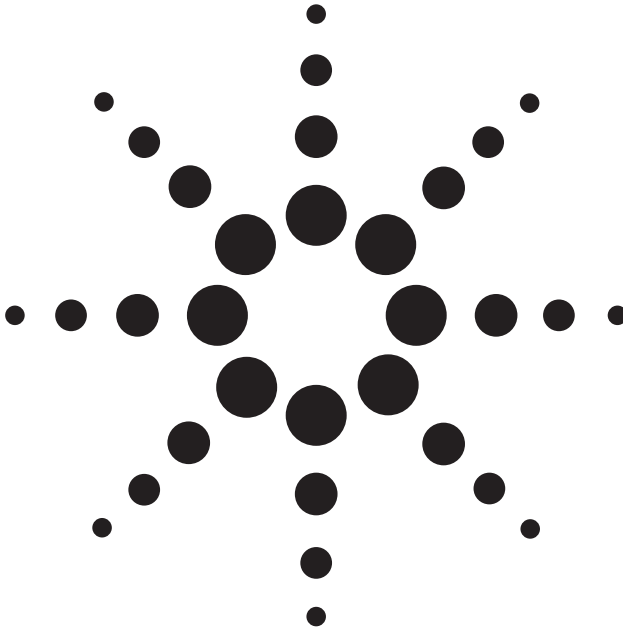
User's Manual



Agilent Technologies

**Agilent Technologies N1655B
Service Advisor
Dual DS3/1, E3/1 Test Module**

User's Manual



Agilent Technologies

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Safety Notices

Observe the following safety precautions whenever you operate the Dual DS3/E3 Test Module. Failure to comply with these and other specific warnings and cautions in this manual is a violation of Agilent Technologies' safety standards of design, manufacturing, and intended use of the test module.

Agilent Technologies assumes no liability for the operator's failure to comply with these precautions.

Product Damage

Danger! Do not use this product if it shows visible damage, fails to perform, has been stored in unfavorable conditions, or has been subject to severe transportation stresses. Make the product inoperative and secure it against any unintended operation. Contact your Agilent Technologies representative for assistance.

Explosion Hazard

Danger! Do not operate a Service Advisor tester in the presence of flammable gases or fumes.

Electric Shock Hazard

Danger! To avoid the possibility of severe injury or death, observe the following precautions when using the Service Advisor Tablet.

Do not remove the system covers, and do not perform electrical tests if there are signs of shipping damage to the outer enclosure.

When connecting test cables to a line, do not touch the cable's metal contact points, or allow the cable leads to touch each other.

Use only the supplied power cords and connect only to a properly grounded wall outlet. Do not use extension cords that do not have a protective ground conductor.

Symbols

The following are general definitions of safety symbols used on equipment and in manuals.

Dangerous voltage.



Protective ground.



Frame or chassis ground.



Alternating current.



Direct current.



Alternating or direct current.



Caution! Read the manual.



Declaration of Conformity

according to ISO/IEC Guide 22 and EN 45014

Manufacturer's Name: Agilent Technologies Company

Manufacturer's Address: Service Test Division
2 Robbins Road
Westford, MA 01886-4113

Declares that the product

Product Name: Dual DS3/1 E3/1 Test Module

Model Numbers: N1655B

Product Options: This declaration covers all options of the above product.

Conforms to the following Product Specifications:

EMC: EN 55011:1991 / CISPR 11:1990 (Group 1, Class A)
EN 50082-1:1992
IEC 801-2:1984 8 kV AD
IEC 801-3:1984 3 V/m
IEC 801-4:1988 0.5 kV signal lines
1 kV AC power lines

Supplementary Information:

The product herewith complies with the requirements of the Low Voltage Directive 73/23/EEC and the EMC Directive 89/336/EEC and carries the CE marking accordingly.

The product was tested in a full configuration.

Denis E. Viel November 29, 2000
Quality Manager Westford, MA, USA

European Contact: Your local Agilent Technologies Sales and Service Office or Agilent Technologies GmbH, Department ZQ/Standards Europe, Herrenberger Strass 130, D-71034 Boeblingen, Germany (FAX +49-7031-14-3143).

About this Book

This section briefly describes the organization of this manual.

Chapter 1 *Getting Started* introduces the Dual DS3/E3 Module and describes the connectors, indicators, and user interface test screen. This chapter also describes how to install the module in a Service Advisor tablet and power the system on.

Chapter 2 *Testing with the N1655B Dual DS3/E3 Module* provides step-by-step instructions for setting up and conducting tests with the N1655B.

Chapter 3 *DS3 Configuration Reference* contains reference information for the DS3 features of the N1655B. This material describes the function and parameters for each of the DS3 controls and indicators on the test screen.

Chapter 4 *DS1 Configuration Reference* contains reference information for the DS1 and FT1 features of the N1655B. This material describes the function and parameters for each of the DS1 controls and indicators on the test screen.

Chapter 5 *E1 Configuration Reference* contains reference information for E1 and FE1 (fractional E1) features of the N1655B. This material describes the function and parameters for each of the E1 controls and indicators on the test screen.

Chapter 6 *Results Reference* contains reference information about all the measurements and results made by the Dual DS3/E3 Module.

Chapter 7 *Printing and Reports* describes how to connect a printer, and how to generate, save, and print reports.

About this Version

Applicability

This version of the *Agilent Technologies N1655B Service Advisor Dual DS3/1 E3/1 Test Module User's Manual* applies to the Service Advisor Tablet running operating system software version **1.41** (or later) and a N1655B Test Module running software version **2.00** (or later).

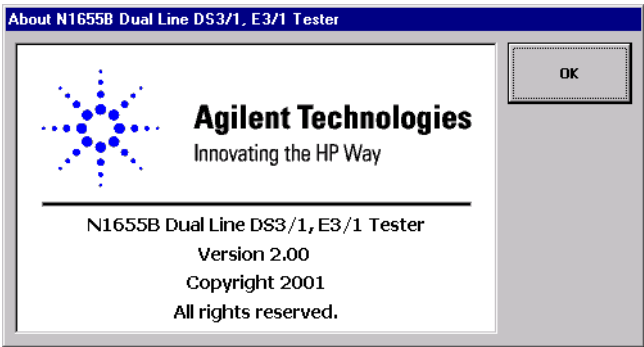
Note that some systems running earlier software may not provide all of the features described in this manual; systems running later versions of software may operate differently than described in this manual. Be sure to refer to any user's manual supplements or release notes that came with the unit, or call Agilent Customer Care at 1-877-878-8018.

Service Advisor Dual DS3/1 E3/1 Test Module User's Manual printing history

Version	Release date	Notes
1.0	March, 2001	Initial release.
2.0	May, 2001	Updated to reflect N1655B software version 2.00.

Check the Software Version

You can check the software version number by pressing the **Help** button on the tablet control screens, or by checking the **Tablet Control** tab of the Service Advisor Manager.



Contents

Declaration of Conformity iv

About this Book v

About this Version vi

1

Getting Started

The N1655B Dual DS3/1 E3/1 Module at a Glance 1-2

Module Connectors 1-3

Module Indicators 1-4

The Dual DS3/1 E3/1 Testing Screen at a Glance 1-5

Installing and Switching On 1-7

Restoring Factory Defaults 1-8

2

Testing with the N1655B Dual DS3/E3 Module

Testing Overview 2-2

Connecting the Module to the System Under Test 2-3

Setting Up the Test 2-4

Configuring the DS3 Signal Parameters 2-5

Configuring the DS3 Drop/Insert Channels 2-6

Configuring the DS1 Signal Parameters 2-8

Configuring the Fractional T1 Setup 2-9

Configuring the E1 Signal Parameters 2-10

Configuring the Fractional E1 Setup 2-11

Applying an External Pattern to a DS3 Channel 2-12

Setting Up Error Injection 2-13

Starting the Test 2-14

Viewing Results 2-15

3

DS3 Configuration Reference

DS3 Test Setup 3-2

DS3 Transmit and Receive Signal Levels 3-3

DS3 Framing Format 3-3

DS3 BER Test Pattern 3-4

DS3 Timing Source 3-6

DS3 Drop and Insert Configuration 3-7

DS3 Error Injection 3-9

4 DS1 Configuration Reference

- DS1 Test Setup 4-2
- DS1 Transmit and Receive Signal Levels 4-4
- DS1 Framing Format 4-5
- DS1 Line Code 4-5
- DS1 Timing Source 4-6
- DS1 BER Test Pattern 4-7
- Fractional T1 (FT1) Setup 4-11
- DS1 Error Injection 4-12

5 E1 Configuration Reference

- E1 Test Setup 5-2
- E1 Transmit and Receive Signal Levels 5-3
- E1 Framing Format 5-4
- E1 Line Code 5-4
- E1 Timing Source 5-5
- E1 BER Test Pattern 5-6
- Fractional E1 (FE1) Setup 5-10
- E1 Error Injection 5-11

6 Results Reference

- Results Display 6-2
- Results Selection Window 6-3
- General Summary Results Screen 6-5
- General RX Signal Results Screen 6-8
- General Event Log Screen 6-9
- DS3 Alarms Results Screen 6-10
- DS3 Errors Results Screen 6-12
- DS2 Alarms Results Screen 6-14
- DS2 Status Results Screen 6-15
- DS1 Alarms Results Screen 6-16
- DS1 Errors Results Screen 6-18
- E1 Alarms Results Screen 6-20
- E1 Errors Results Screen 6-22

7

Printing and Reports

About Dual DS3/E3 Module Reports 7-2

Creating a Report 7-3

Saving a Report 7-4

Opening and Deleting Saved Reports 7-5

Printing Reports 7-6

Customizing Reports 7-7

Warranty, Calibration, and Service

Glossary

Index

The N1655B Dual DS3/1 E3/1 Module at a Glance 1–2

The Dual DS3/1 E3/1 Testing Screen at a Glance 1–5

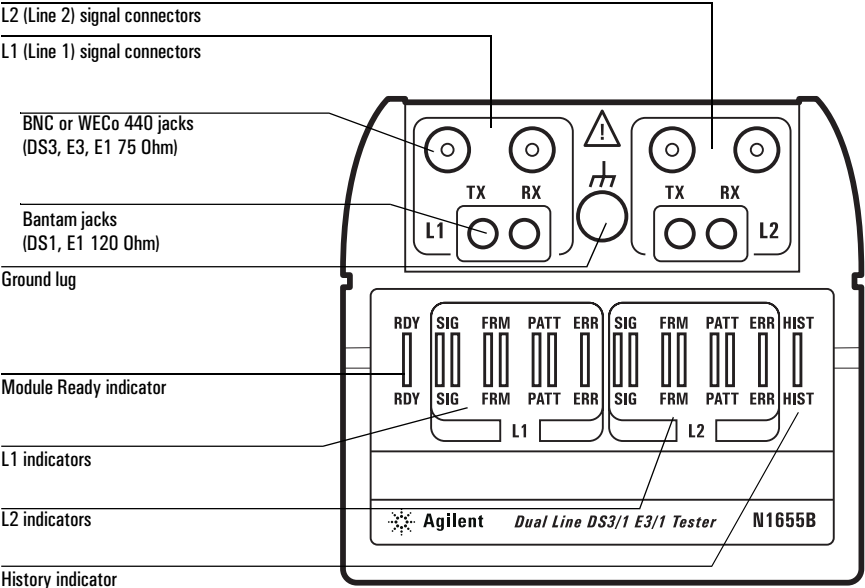
Installing and Switching On 1–7

Restoring Factory Defaults 1–8

Getting Started

The N1655B Dual DS3/1 E3/1 Module at a Glance

The Dual DS3/E3 module plugs into a Service Advisor Test Tablet (N1610A or N1610B) or into the Service Advisor Undercradle (N1700A). The module provides the capabilities to test two DS3/DS1 or E3/E1 lines simultaneously.



Module Connectors

This section describes the signal connectors on the top of the Dual DS3/E3 Module. Refer to the illustration on page 1–2.

L1 and L2: The Dual DS3/E3 module can test two DS3 or E3 lines simultaneously. Each line has its own set of connectors on the module's top panel: L1 (line 1) and L2 (line 2).

TX: TX is the transmit port for L1 and L2. TX supplies the output signal to the system under test.

RX: RX is the receive port for L1 and L2. RX accepts the input signal from the system under test.

BNC or WEC0 440 jacks (high-speed signal): The BNC or WEC0 440 style jacks on the module's top panel are used for DS3 or E3 signals and E1 75-Ohm signals. To activate these jacks, select an appropriate rate for the line. See *Connecting the Module to the System Under Test*, page 2–3.

BNC jacks are provided when the module is ordered with Option 001. WEC0 jacks are provided when the module is ordered with Option 002.

Bantam jacks (low-speed signal): The Bantam style jacks on the module's top panel are used for DS1 or E1 120-Ohm signals. To activate these jacks, select an appropriate rate for the line you are using. See *Connecting the Module to the System Under Test*, page 2–3.

Module Indicators

This section describes the indicator lights on the top of the Dual DS3/E3 Module. Refer to the illustration on page 1–2.

Ready: Lights green and remains lit when the module self test is finished and the Dual DS3/E3 Module is ready to perform tests.

L1/L2 SIG: Lights to indicate a valid signal has been detected for the line (based on the current L1 or L2 signal selection, see *Setting Up the Test*, page 2–4).

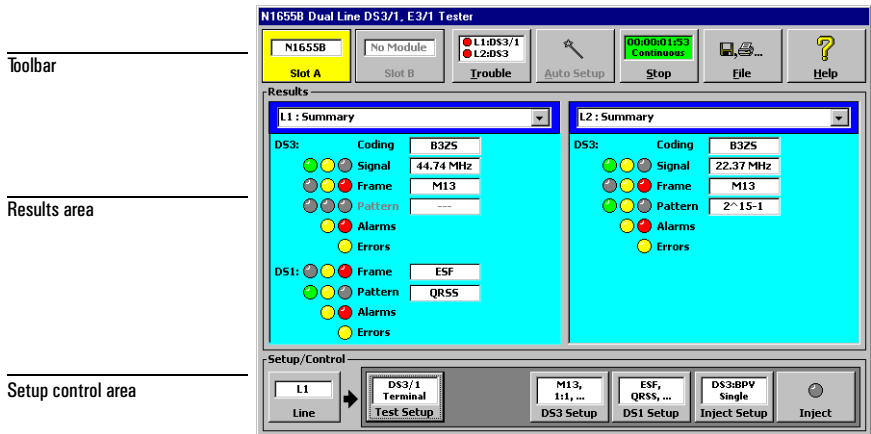
L1/L2 FRM: Lights to indicate a valid framing format has been detected and synchronized on the line based on the current frame selection (See *DS3 Framing Format*, page 3–3, *DS1 Framing Format*, page 4–5, or *E1 Framing Format*, page 5–4).

L1/L2 PATT: Lights to indicate that pattern synchronization has been established on the line, based on the current pattern selection (See *DS3 BER Test Pattern*, page 3–4, *DS1 BER Test Pattern*, page 4–7, or *E1 BER Test Pattern*, page 5–6).

L1/L2 ERR: Lights to indicate an error has been detected on the line (L1 or L2). With intermittent errors, the indicator will blink occasionally. During heavily errored periods, the indicator may stay lit.

HIST: Lights to indicate one or more errors have occurred previously during the current test. HIST will remain lit until a new test starts.

The Dual DS3/1 E3/1 Testing Screen at a Glance



Toolbar

The toolbar contains buttons for selecting modules and controlling tests.

Slot Buttons: The Slot A and Slot B buttons select the active test module, if two modules are installed in the Service Advisor Tablet. If the second module is not a Dual DS3/1 E3/1 module, that module's interface will be launched.

Trouble Scan Button: Tap the Trouble button to automatically scan for error or alarm conditions on the signal under test. Conditions are displayed on the button, and can be displayed in the Results area.

Auto Setup Button: The Auto Setup button triggers the Dual Module's automatic test configuration feature. Tap Auto Setup to have the module automatically analyze the received signal and configure itself to the signal.

Start/Stop Button: The test Start/Stop button controls testing. When testing is stopped, the button reads "Start". Tapping Start begins the test. When a test is running, the button reads "Stop". Tapping it halts the test.

File Button: Tapping the File Button opens the File menu, which provides access to data report printing and storage (see Chapter 7, *Printing and Reports*), test time setup, and factory default settings.

Help Button: Tap the Help button to display the N1655B software version data.

Results Area

The N1655B Dual DS3/E3 test module interface features a two-paned Results display area. This area allows you to view two sets of results simultaneously. For example, you can view test data from line 1 and line 2 together, or view both DS3 and DS1 results from the same signal, and so on. For more information, Chapter 6, *Results Reference*.

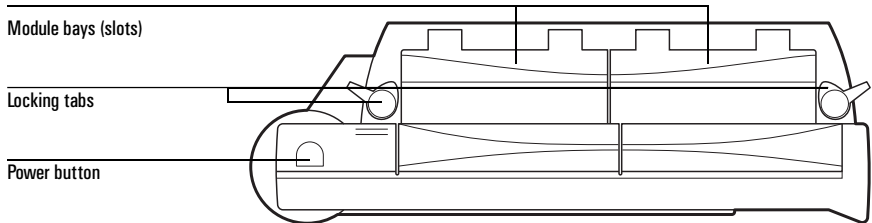
Setup Control Area

The Setup Control area at the bottom of the Dual DS3/E3 test module screen provides buttons for configuring the module parameters for each line (L1 and L2). For more information, see *Setting Up the Test*, page 2–4.

Installing and Switching On

This procedure describes how to install the Dual DS3/E3 test module in a Service Advisor Test Tablet and switch the system on. For more information on Test Tablet operations, refer to the *User's Manual* that came with your tablet.

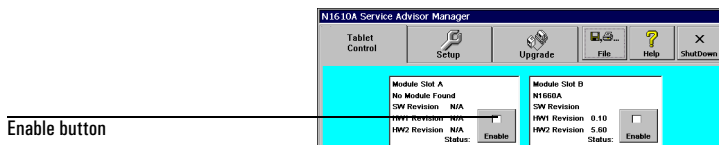
1. Select an unused module bay (slot) in the Service Advisor Tablet.



The Dual DS3/E3 module uses one slot in the Tablet. Either slot can be used.

2. Open the module bay cover and align the module with the bay. The module's label must face toward the front of the Tablet.
3. Slide the Dual DS3/E3 module into the bay until it is firmly seated.
4. Rotate the locking tab to secure the module in the bay.
5. Power on the Tablet by pressing and holding the power switch. During power up, the Tablet will sound a tone and display the Service Advisor Manager screen.
6. If the Auto Start Module feature is enabled on the Tablet, powering on the tablet also powers on the Dual DS3/E3 Module and the DS3/E3 Testing screen is automatically launched.

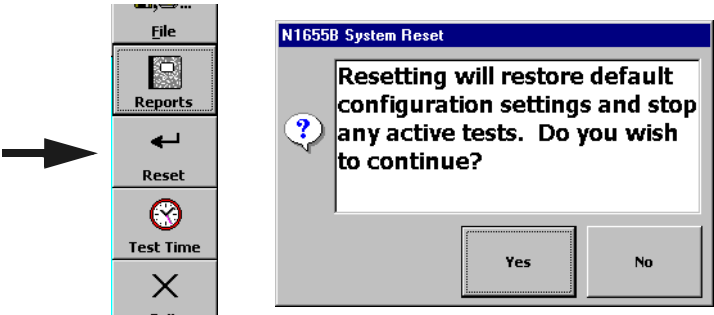
If the Auto Start Module feature is not enabled, tap the appropriate Enable button on the Service Advisor Manager Tablet Control screen.



7. When the Dual DS3/E3 module's RDY (ready) indicator lights, the unit is ready for use.

Restoring Factory Defaults

When you tap the Reset button on the File menu, the System Reset window appears:



Tap Yes to restore the factory-programmed default parameter values and stop any active tests. Tap No to cancel the operation.

Testing Overview	2-2
Connecting the Module to the System Under Test	2-3
Setting Up the Test	2-4
Configuring the DS3 Signal Parameters	2-5
Configuring the DS3 Drop/Insert Channels	2-6
Configuring the DS1 Signal Parameters	2-8
Configuring the Fractional T1 Setup	2-9
Configuring the E1 Signal Parameters	2-10
Configuring the Fractional E1 Setup	2-11
Applying an External Pattern to a DS3 Channel	2-12
Setting Up Error Injection	2-13
Starting the Test	2-14
Viewing Results	2-15

Testing with the N1655B Dual DS3/E3 Module

Testing Overview

The following steps describe the basic testing procedure for the Dual DS3/E3 Module. For each step, you will need to make selections and changes to meet your specific testing needs. Further details are provided in subsequent sections.

Note: Before you begin testing, make sure the Dual DS3/E3 Module is properly installed and the Service Advisor system is powered on. See *Installing and Switching On*, page 1–7.

1. Connect the Dual DS3/E3 Module to the system to be tested. Be sure to connect the signals to the appropriate connectors on the module (see page 2–3).

If you are testing a single line, connect it to either the L1 or L2 jacks. If you are testing two lines, connect one to the L1 (line 1) jacks and the other to the L2 (line 2) jacks.
2. Begin test setup by selecting the line to configure. Tap the Line button in the Setup/Control area.
3. Select the type of test to perform by tapping the Test Setup button. Choose the Rate, Payload and Mode for the test. See page 2–4.
4. Configure signal parameters starting with the highest-rate signal in your test.
5. If applicable, tap the DS3 Setup button to configure the TX and RX signal level, framing format, pattern, and clock source. See page 2–5.
6. If applicable for your test, configure the drop/insert channels. See page 2–6.
7. If applicable, tap the DS1 Setup or E1 Setup button to configure the level, framing format, line code, pattern and clock source. See page 2–8 (DS1) or page 2–10 (E1).
8. Tap the Inject Setup button to configure the error injection parameters. See page 2–13.
9. Select a test time mode and begin the test. See page 2–14.
10. View test results as desired. See page 2–15.

Connecting the Module to the System Under Test

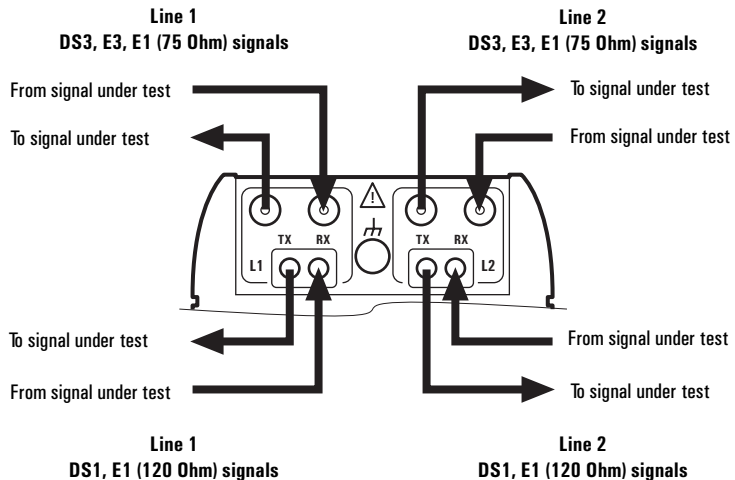
The following procedure describes how to connect the Dual DS3/E3 Module to the system to be tested.

- Using the following table, determine which signal jacks to use on the module.

Signal to be tested	Module jacks to use
DS3 (44.736 Mbs)	BNC or WEC0 440 jacks [†]
DS1 (1.544 Mbs), including FT1 (fractional)	Bantam jacks
E3 (34.368 Mbs)	BNC or WEC0 440 jacks [†]
E1 (2.048 Mbs), 120 Ohm, including FE1 (fractional)	Bantam jacks
E1, 75 Ohm, including FE1 (fractional)	BNC or WEC0 440 jacks [†]

[†] BNC jacks are provided when the module is ordered with Option 001. WEC0 440 jacks are provided when the module is ordered with Option 002.

- Connect the signal coming from the system under test to the appropriate RX jack. Connect the signal going to the system under the test to the appropriate TX jack. If you are testing two lines, make these connections for both lines.



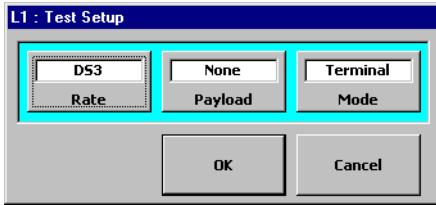
Setting Up the Test

Setting Up the Test

This procedure describes how to select and configure the module's interface for the system under test. The current configuration is displayed in the Setup/Control area of the screen.



1. Tap the Line button to select a line to configure (L1 or L2).
2. Tap the Test Setup button to call the Test Setup screen for the selected line.



3. Tap the Rate button to select the type of signal being tested. Note that this control also determines which TX and RX connectors are active on the module (see *Connecting the Module to the System Under Test*, page 2–3).

For more information, see *DS3 Test Setup*, page 3–2, *DS1 Test Setup*, page 4–2, or *E1 Test Setup*, page 5–2.
4. Tap the Payload button to select the payload on the currently selected signal. see *DS3 Test Setup*, page 3–2, *DS1 Test Setup*, page 4–2, or *E1 Test Setup*, page 5–2.
5. Tap the Mode button to select a test mode for the module. You can select a terminal, monitor, internal loop, or external loop test.
6. When you have finished configuring the Test Setup, tap OK to accept your changes and close the window. Tap Cancel to close the window without making any changes.

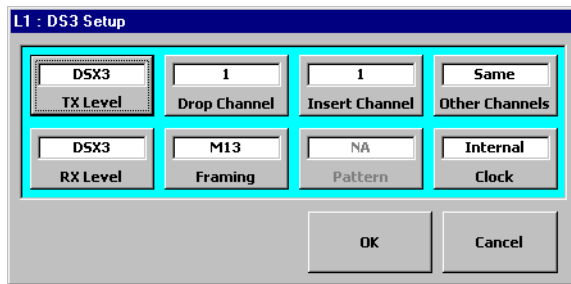
Configuring the DS3 Signal Parameters

This procedure describes how to configure the DS3 signal parameters for the system under test.

1. Select the DS3 rate for the line, using the Test Setup button. See *Setting Up the Test*, page 2–4. In the Setup/Control area, the DS3 Setup button will be displayed.



2. Tap the DS3 Setup button to call the DS3 Setup screen.

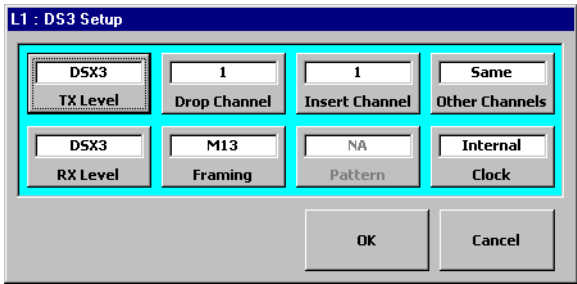


3. Tap the TX Level button to select a transmit signal level to match the system you are testing. Do the same for the receive signal level using RX Level. See *DS3 Transmit and Receive Signal Levels*, page 3–3.
4. Tap the Framing button to select the framing format used on the DS3 signal (M13 or C-bit; See *DS3 Framing Format*, page 3–3).
5. Tap Clock to select a transmit clock (timing) source. See *DS3 Timing Source*, page 3–7.
6. If you selected None for the DS3 payload on the Test Setup screen, tap the Pattern button to select a payload pattern on the DS3. See *DS3 BER Test Pattern*, page 3–4.
7. If you selected a subrate signal as the DS3 payload on the Test Setup screen (for example DS1 or E1; See *Setting Up the Test*, page 2–4), refer to *Configuring the DS3 Drop/Insert Channels*, page 2–6, for information on configuring the drop and insert channels.
8. When you have finished, tap OK to accept your changes and close the window. Tap Cancel to close the window without making any changes.

Configuring the DS3 Drop/Insert Channels

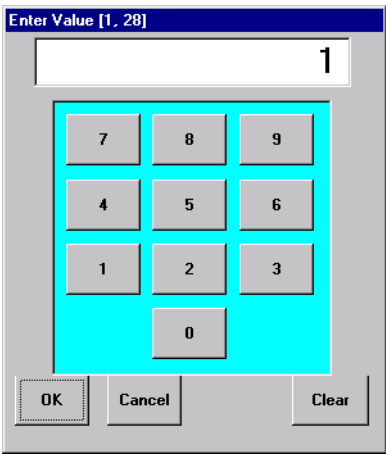
This section describes how to configure the drop and insert channels (mux/demux) on a DS3 signal carrying subrate traffic.

- To configure the module for a DS3 signal carrying subrate (DS1, FT1, E1, FE1) traffic, set the Payload as appropriate on the Test Setup window. See *Setting Up the Test*, page 2–4.
- When the Dual DS3/E3 Module is configured for a DS3 with subrate traffic, the Drop Channel, Insert Channel, and Other Channels buttons are active (not grayed out) on the DS3 Setup screen.



- Tap the Drop Channel button to select a DS1/FT1 or E1/FE1 channel to be dropped (demultiplexed) from the DS3 signal.

Tapping the button calls a keypad data entry window.



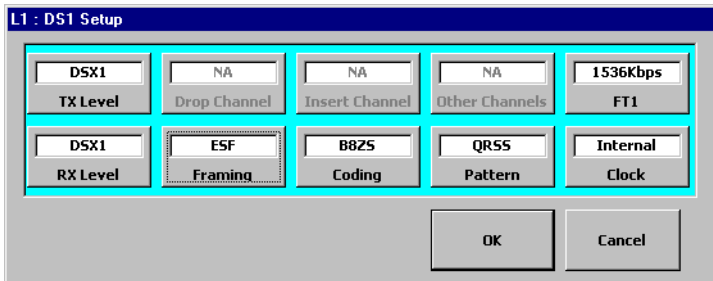
3. Enter the number of the channel to drop, then tap OK to confirm your entry. Tap Cancel to close the window without making any changes. Tap Clear to delete the value.
4. Tap the Insert Channel button to select a channel to be inserted (multiplexed) into the DS3 signal. Enter the channel number on the keypad window as you did for the Drop Channel (see step 2).
5. Tap the Other Channels button to select how the remaining channels (not being dropped or inserted) on the DS3 are handled. See *DS3 Drop and Insert Configuration*, page 3–8.

Configuring the DS1 Signal Parameters

Configuring the DS1 Signal Parameters

This procedure describes how to configure the DS1 signal parameters. The N1655B can test DS1 signals that are connected directly, or that are carried on a DS3 signal.

- To configure the Dual DS3/E3 Module for DS1, you must either select DS1 as the Rate, or select DS3 as the Rate and DS1 or FT1 as the Payload in the Test Setup window (see *Setting Up the Test*, page 2–4).
- Tap the DS1 Setup button to call the DS1 Setup window.



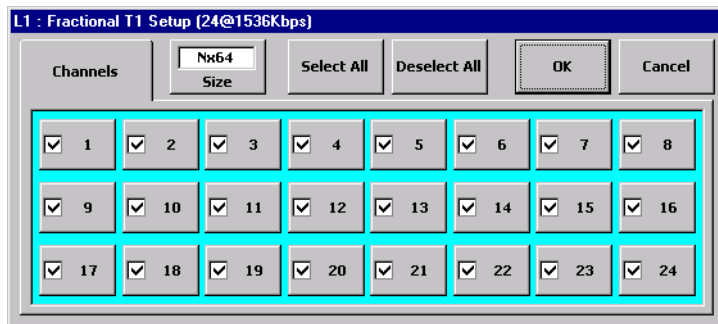
Note that the DS1 Setup window may appear slightly different depending on your test application.

- Use the TX Level and RX level button to set the transmit and receive DS1 signal levels (not required if the DS1 is carried on a DS3). See *DS1 Transmit and Receive Signal Levels*, page 4–4.
- Tap the Coding button to select the line coding used on the DS1 (not applicable if the DS1 is carried on a DS3).
- Select the framing format by tapping the Framing button.
- Tap the Clock button to select the DS1 transmit timing source. See *DS1 Timing Source*, page 4–6.
- Select a test pattern by tapping the Pattern button. The Select a BERT Pattern window is displayed. Select a pattern category tab, then select the pattern (See *DS1 BER Test Pattern*, page 4–7). Tap the OK button to close the Pattern window.
- If you are testing FT1 (fractional T1) signals, configure those parameters now. See *Configuring the Fractional T1 Setup*.

Configuring the Fractional T1 Setup

This procedure describes how to configure the FT1 parameters.

- To configure the Dual DS3/E3 Module for FT1, you must select FT1 as the Payload in the Test Setup window (see *Setting Up the Test*, page 2–4). The Rate can be either DS3 or DS1.
- From the DS1 Setup window (see *Configuring the DS1 Signal Parameters*) tap the FT1 button to call the Fractional T1 Setup window.

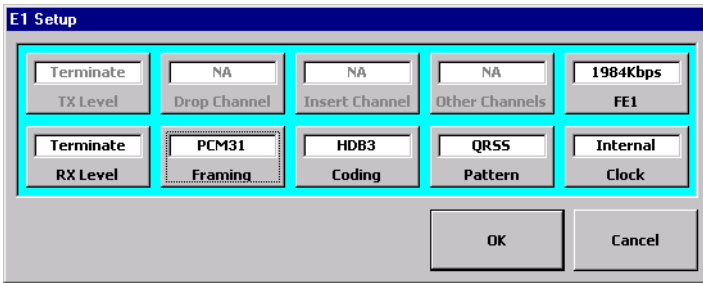


- Choose the fractional T1 channel size (either 56 kbs or 64 kbs). See *Fractional T1 (FT1) Setup*, page 4–11.
- Select the channels on the DS1 that you want to use for your FT1 BERT testing. Tapping a channel button toggles it between selected and deselected. Or you can tap Select All or Deselect All.
- When you have finished, tap OK to confirm your changes and close the window. Tap cancel to close the window without making any changes.

Configuring the E1 Signal Parameters

This procedure describes how to configure the E1 signal parameters for the system under test. The N1655B can test E1 signals that are connected directly or carried on a DS3 signal.

- To configure the N1655B for E1, select either E1 as the Rate, or select DS3 as the Rate and E1 or FE1 as the Payload (see *Setting Up the Test*, page 2–4).
- Tap the E1 Setup button to call the E1 Setup window.



Note that the E1 Setup window may appear slightly different depending on your test application.

- Use the RX Level button to set the input E1 signal level (not required if the E1 is carried on a DS3). See *E1 Transmit and Receive Signal Levels*, page 5–3.

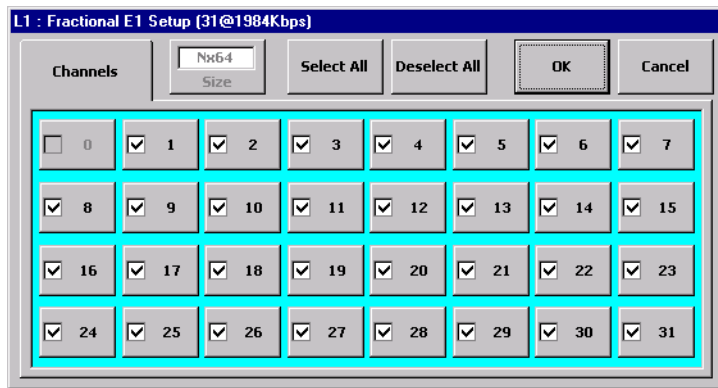
Note: If the E1 signal is connected directly to the module (not carried on a DS3), select which connectors are used when you set Rate to E1 (see *Setting Up the Test*, page 2–4). For information on which connectors are active, see *Connecting the Module to the System Under Test*, page 2–3.

- Tap the Coding button to select the line coding used on the E1 (not applicable if the E1 is carried on a DS3). See *E1 Line Code*, page 5–4.
- Select the framing format by tapping the Framing button (page 5–4).
- Tap the Clock button to select the E1 transmit timing source (page 5–5).
- Select a test pattern by tapping the Pattern button. The Select a BERT Pattern window displays. Select a pattern category tab, then select the pattern (see *E1 BER Test Pattern*, page 5–6). Tap the OK button to close the Pattern window.
- If you are testing FE1 (fractional E1) signals, configure those parameters now. See *Configuring the Fractional E1 Setup*, page 2–11.

Configuring the Fractional E1 Setup

This procedure describes how to configure the FE1 parameters.

- To configure the Dual DS3/E3 Module for FE1, you must select FE1 as the Payload in the Test Setup window (see *Setting Up the Test*, page 2–4). The Rate can be either DS3 or E1.
- In the E1 Setup window (see *Configuring the E1 Signal Parameters*), tap the FE1 button to call the Fractional E1 Setup window.

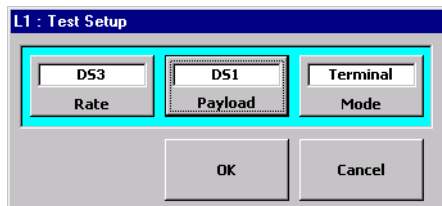


- Select the channels on the E1 that you want to use for your FE1 BERT testing. You can tap each channel button to select or deselect it, or you can tap Select All or Deselect All.
- When you have finished, tap OK to confirm your changes and close the window. Tap cancel to close the window without making any changes.

Applying an External Pattern to a DS3 Channel

This procedure describes how to insert the payload pattern from an external DS1 or E1 signal onto a channel of the DS3 signal.

1. Connect the DS3 signal to be tested to the appropriate signal jacks (BNC or WECO) on the module (see *Connecting the Module to the System Under Test*, page 2–3).
2. Connect the DS1 or 120-Ohm E1 signal with the external pattern you want to use to the Bantam RX jack on the same Line as the DS3.
3. Set up the test so that the Rate is DS3 and the Payload is either DS1 or E1. See *Setting Up the Test*, page 2–4.



4. Configure the DS3 signal (see *Configuring the DS3 Signal Parameters*, page 2–5).
5. Configure the DS3 drop and insert channels. See *Configuring the DS3 Drop/Insert Channels*, page 2–6.
6. Configure the DS1 signal (see page 2–8) or E1 signal (see page 2–10), as appropriate. Be sure to set the Pattern to EXT.



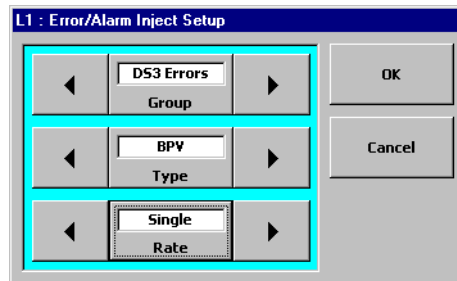
7. The Module is now set up to use an external pattern.

When configured this way, the N1655B will extract the payload pattern from the DS1 or E1 signal connected to the low-speed (Bantam) jacks. This pattern is then applied to the DS1 or E1 signal inserted on the transmit DS3 signal.

Setting Up Error Injection

This procedure describes how to configure the error and alarm injection features of the Dual DS3/E3 Module. For more information, see *DS3 Error Injection*, page 3–10, *DS1 Error Injection*, page 4–12, or *E1 Configuration Reference*, page 5–1.

1. Tap the Inject Setup button to call the Error/Alarm Inject Setup window.



2. To select a category, or group, of errors or alarms, tap the Group arrow buttons to cycle through the available categories. You can also tap the Group button to call a window from which you can select the group.
3. Select the type of error or alarm to inject by tapping the Type arrow buttons to cycle through the choices. You can also tap the Type button and select a type from the window.

Note that the available injection types are determined by the category you select with the Group button in step 2.

4. Tap the Rate arrow buttons to cycle through the available error injection rates. You can also tap the Rate button to call a window from which you can select the injection rate.
5. When you have configured the error and alarm injection parameters, tap OK to close the window. Tap Cancel to close the window without making any changes.
6. Tap the Inject button in setup/Control area to activate or deactivate error injection. When injection is active, the Inject indicator turns red.

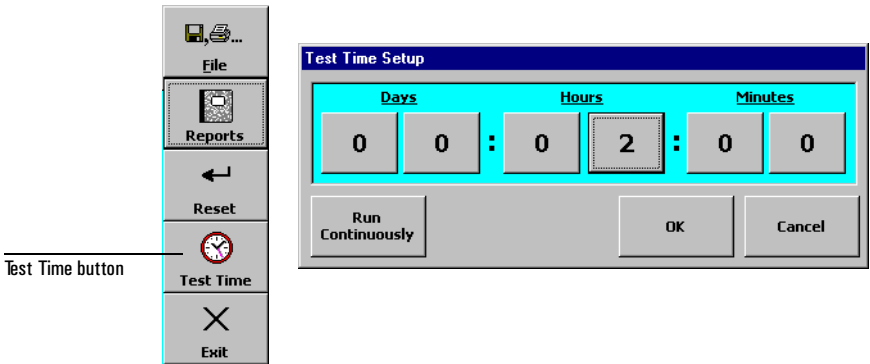


Starting the Test

Starting the Test

This procedure describes how to set the test time mode and begin a test.

1. After you have configured the Dual DS3/E3 Module for your applications, select a test time mode by tapping the File button.
2. Tap the Test Time button to call the Test Time Setup window.

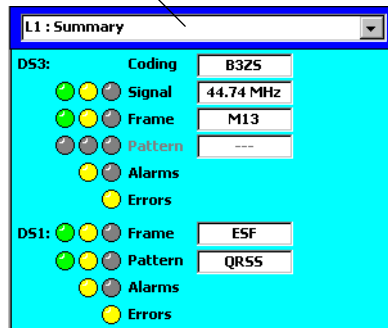


3. Select a time mode by either tapping the Run Continuously button, or by tapping the time buttons to set the duration for a timed test. Tap OK to confirm your selection and close the window, or tap Cancel to close the window without making changes.
4. To begin the test, tap the Start button.
The Start button changes to the Stop button. The elapsed and remaining time are displayed on the Start/Stop button.
5. To end a test, tap the Stop button.

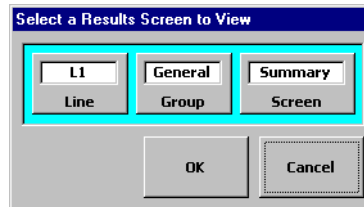
Viewing Results

This procedure describes how to view the various test results available on the Dual DS3/E3 Module's screen.

Results selector



1. Test results are displayed in two side-by-side panes in the results area of the Dual DS3/E3 Module window. To select which results are displayed in a pane, tap the results selector button. The Select a Results Screen to View window displays.



2. Tap the Line button to select which line's results are displayed in that pane.
3. Tap the Group button to select the results category.
4. Tap the Screen button to select a results screen to display in the pane. Note that the available results screen are determined by the group you select in step 3.
5. Tap OK to confirm your selection and close the window. Tap Cancel to close the window without making changes.
6. Configure the other results display pane as desired. Each results pane is independent of the other.

For more information, refer to Chapter 6, *Results Reference*.

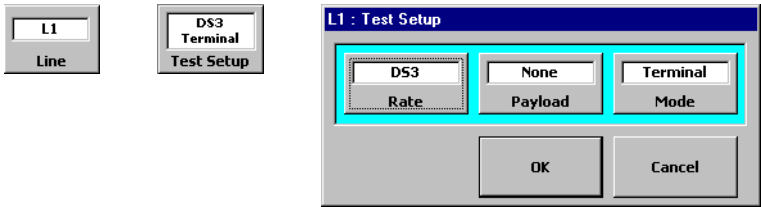
DS3 Test Setup	3-2
DS3 Transmit and Receive Signal Levels	3-3
DS3 Framing Format	3-3
DS3 BER Test Pattern	3-4
DS3 Timing Source	3-7
DS3 Drop and Insert Configuration	3-8
DS3 Error Injection	3-10

DS3 Configuration Reference

DS3 Test Setup

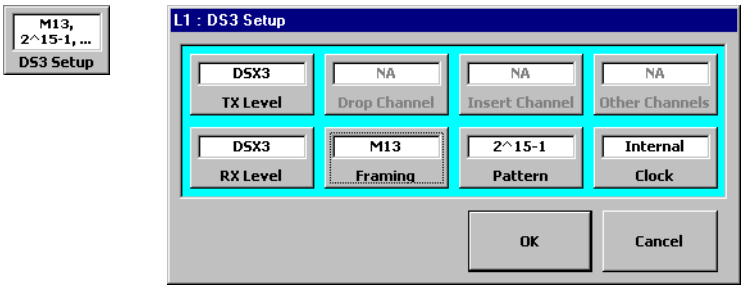
DS3 Test Selection

The Dual DS3/E3 Module can test DS3 signals when Rate is set to DS3 in the Test Setup window for L1 or L2 (see *Setting Up the Test*, page 2–4).



DS3 Setup Window

When the Test Setup Rate is set to DS3, the DS3 Setup button is displayed in the Setup/Control area. Tap this button to call the DS3 Setup window.



The following table lists the controls found on the DS3 Setup window.

DS3 Setup control	More information
TX Level, RX Level	See <i>DS3 Transmit and Receive Signal Levels</i> , page 3–3
Framing	See <i>DS3 Framing Format</i> , page 3–3
Pattern	See <i>DS3 BER Test Pattern</i> , page 3–4
Clock	See <i>DS3 Timing Source</i> , page 3–7
Drop, Insert, Other Channels	See <i>DS3 Drop and Insert Configuration</i> , page 3–8

DS3 Transmit and Receive Signal Levels

The TX Level and RX Level buttons control the signal level of the transmit and receive DS3 signals.



These buttons are located on the DS3 Setup screen. The transmit and receive signal levels are independent for L1 and L2.

Transmit Level

TX Level affects the L1 and L2 TX BNC or WEC0 440 output connectors, and can be set to either of the following:

DSX3: DS3 cross-connect level. Uses a line build-out (LBO) of 450 feet of simulated cable.

High: High level signal. No LBO is used.

Receive Level

RX Level affects the L1 and L2 RX BNC or WEC0 440 input connectors, and can be set to either of the following:

DSX3: Uses an automatic equalizer for 0 through 900 feet of cable.

Monitor: accepts a monitor level signal with up to 26 dBdsx flat loss.

DS3 Framing Format

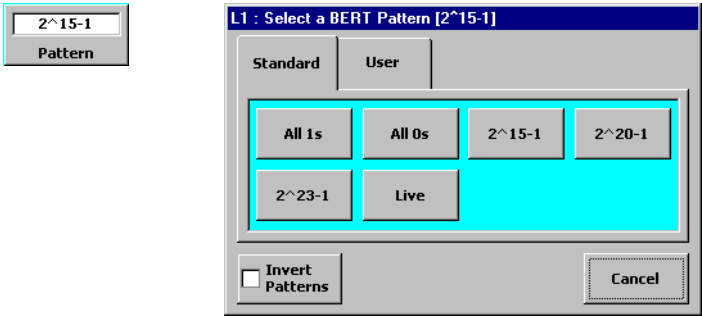
The Framing button on the DS3 Setup window controls the framing format used on the DS3 signal.



The framing is controlled independently for each line (L1 and L2). Framing can be set to M13, CBit (C-Bit), or None (unframed).

DS3 BER Test Pattern

The Dual DS3/E3 Module offers many choices for the pattern used in BER (bit error ratio) testing. To select a pattern, tap the Pattern button on the DS3 Setup window to call the Select Pattern window.



Note: The Pattern button is disabled (grayed out) when the DS3 is carrying subrate traffic such as DS1, FT1, E1, or FE1.

Category Tabs: Use the tabs on the Select Pattern window to select the category of pattern. Standard and User (user-programmed) patterns are available.

Pattern Inversion: Tapping the Invert Patterns button inverts all of the test patterns. Inverted pattern are displayed preceded by a slash (“/”).

Standard Patterns

The following table describes the standard patterns available.

DS3 BER Test Patterns

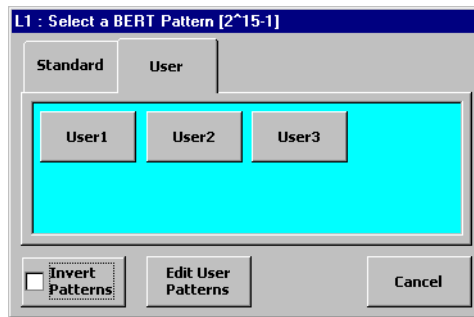
Pattern	Description
All 1s	An all-ones (binary 1111...) pattern.
All 0s	An all-zeros (binary 0000...) pattern.
2^15-1	A 2 ¹⁵ -1 pseudorandom bit sequence (PRBS).
2^20-1	A 2 ²⁰ -1 PRBS.

DS3 BER Test Patterns, continued

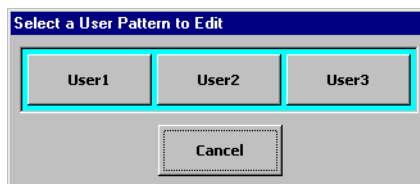
Pattern	Description
$2^{23}-1$	a $2^{23}-1$ PRBS.
Live	Live traffic (no pattern set for receive signal; transmit signal carries $2^{15}-1$ PRBS).

User-Programmable Patterns

Selecting the User tab on the Select Pattern window displays the User Pattern category.

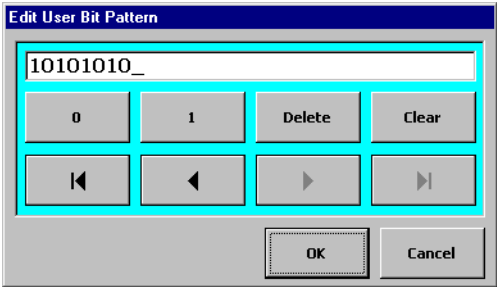


Tap a User button to select that pattern. To view or edit a user pattern, tap the Edit User Pattern button. This calls the Select a User Pattern to Edit window.



DS3 BER Test Pattern

Tap one of the User buttons on this window to call the Edit User Pattern window.



Use the buttons on the Edit Pattern window to configure the pattern. The DS3 user patterns can be set from 1 to 32 bits long.

DS3 Timing Source

The Clock button on the DS3 Setup window configures the source of the transmit timing for the DS3 signal. The clock is set independently for each line (L1 and L2).



DS3 Clock can be set to any of the following:

Internal: Timing is from the Dual DS3/E3 Module's internal clock.

Rcv1: Timing is derived from the input DS3 signal at the L1 RX BNC or WEC0 440 jack.

Rcv2: Timing is derived from the input DS3 signal at the L2 RX BNC or WEC0 440 jack.

DS3 Drop and Insert Configuration

When the DS3 signal is carrying subrate traffic (DS1, FT1, E1, FE1), use the Drop and Insert buttons to control which subrate channels are demultiplexed and multiplexed to and from the DS3. Multiplexing is configured separately for each line (L1 and L2).

The Drop Channel, Insert Channel, and Other Channels are only active (not grayed out) when the Rate is set to DS3 and the Payload is set to DS1, FT1, E1, or FE1 on the Test Setup window (see *Setting Up the Test*, page 2–4).

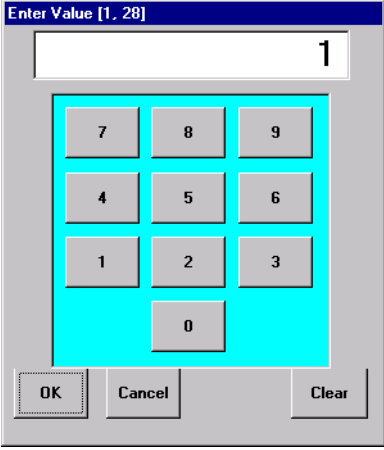
L1 : DS3 Setup			
DSX3 TX Level	1 Drop Channel	1 Insert Channel	Same Other Channels
DSX3 RX Level	M13 Framing	NA Pattern	Internal Clock
		OK	Cancel

Drop Channel: Selects which DS1 channel (1 to 28) or E1 channel (1 to 21) is dropped from the receive DS3 signal.

Insert Channel: Selects which DS1 channel (1 to 28) or E1 channel (1 to 21) is inserted to the transmit DS3 signal.

Other Channels: Configures what is carried on the remaining DS1 or E1 channels (not selected by Drop or Insert). This can be set to Same (same data as carried on the drop/insert channels) or AIS (alarm indication signal).

Enter Value window: Tapping Drop Channel or Insert Channel calls a keypad window that allows you to enter the number of the channel.

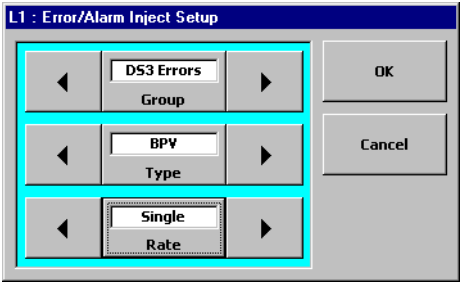


The image shows a software window titled "Enter Value [1, 28]". At the top is a text input field containing the number "1". Below the input field is a numeric keypad with buttons for digits 0 through 9. The keypad is arranged in a 3x3 grid with an additional row for 0. The buttons are labeled 7, 8, 9 in the first row; 4, 5, 6 in the second row; 1, 2, 3 in the third row; and 0 in a separate button below the third row. At the bottom of the window are three buttons: "OK", "Cancel", and "Clear".

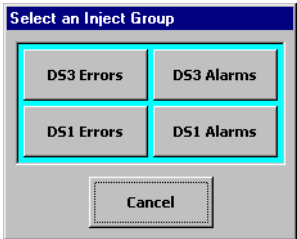
Use the number buttons to enter the channel. Tap OK to confirm your selection and close the window. Tap Cancel to close the window without making any changes. Tap Clear to erase any entered digits.

DS3 Error Injection

DS3 error injection is controlled using the Inject Setup and Inject buttons. To configure DS3 error injection tap the Inject Setup button to call the Error/Alarm Inject Setup window.



To select DS3 error or alarm injection, tap the Group button and select either DS3 Errors or DS3 Alarms.



DS3 Error/Alarm Types

To select the specific type of DS3 error or alarm to be injected, tap the Type button (or use the Type arrow buttons) to make your selection. The following table lists the available DS3 error and alarm injection types.

DS3 Error Injection Selections		
Injection Category	Injection Type	Description
DS3 Errors	BPV	DS3 bipolar violations
	Frame	DS3 framing errors (F1 and F0 bits)
	Bit	DS3 pattern bit errors
	P-Bit	DS3 section parity bit errors (P1 and P2 bits)
	CP-Bit	DS3 path parity bit errors (C31, C32, and C33 bits)
	REI	DS3 remote error indication Also called FEBE (far end block error)
DS3 Alarms	LOS	DS3 loss of signal
	OOF	DS3 out of frame condition
	RAI	DS3 remote alarm indication
	AIS	DS3 alarm indication signal
	Idle	DS3 idle signal (repeating 1100 ... pattern)

DS3 Error Injection Rate

To configure the DS3 error injection rate, tap the Rate button to call the Select Inject rate window (or use the Rate arrow buttons. The injection rate can be set to one of the following:

Single: Injects one occurrence of the selected error type each time the Inject button is tapped in the Setup/Control area.

1E-n: Selects a continuous rate of injection in the format 1×10^{-n} , where n becomes the denominator. For example, 1E-3 is equivalent to 1×10^{-3} , or one error injected for every 1000 bits.

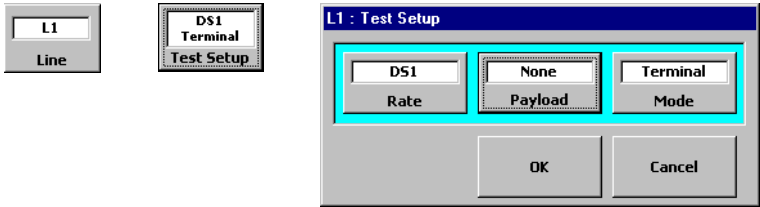
DS1 Test Setup	4-2
DS1 Transmit and Receive Signal Levels	4-4
DS1 Framing Format	4-5
DS1 Line Code	4-5
DS1 Timing Source	4-6
DS1 BER Test Pattern	4-7
Fractional T1 (FT1) Setup	4-11
DS1 Error Injection	4-12

DS1 Configuration Reference

DS1 Test Setup

DS1 Test Selection

The Dual DS3/E3 Module can test DS1 signals when Rate is set to DS1, or when Rate is set to DS3 and Payload is set to DS1 or FT1 in the Test Setup window for L1 or L2 (see *Setting Up the Test*, page 2–4).



DS1 Setup Window

When the Test Setup Rate or Payload is set to DS1, the DS1 Setup button is displayed in the Setup/Control area. Tap this button to call the DS1 Setup window.



The table on the following page lists the controls found on the DS1 Setup window.

DS1 Test Setup Parameters

DS1 Setup control	More information
TX Level, RX Level	See <i>DS1 Transmit and Receive Signal Levels</i> , page 4–4
Framing	See <i>DS1 Framing Format</i> , page 4–5
Coding	See <i>DS1 Line Code</i> , page 4–5
Clock	See <i>DS1 Timing Source</i> , page 4–6
Pattern	See <i>DS1 BER Test Pattern</i> , page 4–7
Drop, Insert, Other Channels	Not active in this release.
FT1	See <i>Fractional T1 (FT1) Setup</i> , page 4–11

DS1 Transmit and Receive Signal Levels

The TX Level and RX Level buttons control the signal level of the transmit and receive DS1 signals.



These buttons are located on the DS1 Setup screen. The transmit and receive signal levels are independent for L1 and L2.

Transmit Level.

TX Level affects the L1 or L2 TX Bantam output connectors, and can be set to any of the following:

DSX1: DS1 cross-connect level per TR-TSY-000499.

LBO -7.5dB: Adds a line build out (LBO) of 7.5 decibels attenuation from the DSX-1 level.

LBO -15dB: Adds an LBO of 15 dB from DSX-1 level.

LBO -22 dB: Adds an LBO of 22 dB from DSX-1 level.

Receive Level

RX Level affects the L1 or L2 RX bantam input connectors, and can be set to either of the following:

DSX1: DS1 cross-connect level. Automatically equalizes for 0 to 655 feet of cable.

Monitor: Monitor level. 10 to 25 dB flat loss relative to DSX-1 level.

DS1 Framing Format

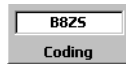
The Framing button on the DS1 Setup window controls the framing format used on the DS1 signal.



The framing is controlled independently for each line (L1 and L2). Framing can be set to ESF (extended superframe), D4 (also called SF or superframe), or None (unframed).

DS1 Line Code

The Coding button on the DS1 Setup window sets the line coding scheme used on the DS1 signal. The line code is controlled independently for each line (L1/L2).



The line code can be set to either B8ZS (bipolar with eight-zero substitution) or AMI (alternate mark inversion).

Note that the Coding button is disabled (grayed out) when the DS1 signal is the payload of a DS3 signal.

DS1 Timing Source

The Clock button on the DS1 Setup window configures the source of the transmit timing for the DS1 signal. The clock source is set independently for each line (L1 and L2).



The DS1 clock source can be set to any of the following:

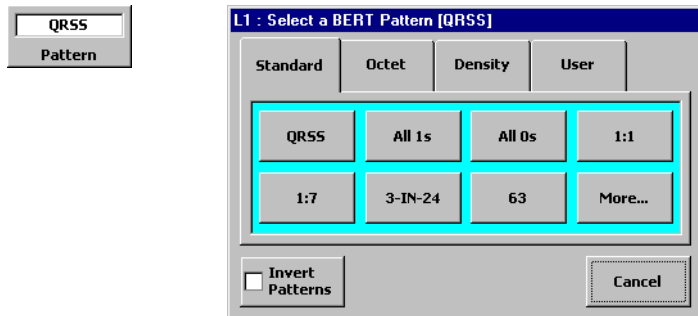
Internal: Timing is from the Dual DS3/E3 Module's internal clock.

Rcv1: Timing is derived from the input DS1 signal at the L1 RX Bantam jack.

Rcv2: Timing is derived from the input DS1 signal at the L2 RX bantam jack.

DS1 BER Test Pattern

The Dual DS3/E3 Module provides a variety of test patterns for DS1 BER (bit error ratio) testing. To select a pattern, tap the Pattern button on the DS1 Setup window to call the Select Pattern window.



Category Tabs: Use the tabs on the Select Pattern window to select the category of pattern. Standard, Octet, Density, and User (user-programmed) patterns are available. The patterns are described on page 4–8 to page 4–10.

Pattern Inversion: Tapping the Invert Patterns button inverts all of the test patterns. Inverted patterns are displayed preceded by a slash ("/").

DS1 BER Test Pattern

DS1 Standard Patterns

The following table describes the standard patterns available. Note that not all of the Standard patterns are displayed on the tab at once. Tap the More... button to view additional patterns.

DS1 BER Test Patterns	
Pattern	Description
QRSS	A quasirandom signal source. This is a $2^{20}-1$ pattern with a 14-zero constraint.
All 1s	An all-ones (binary 1111...) pattern.
All 0s	An all-zeros (binary 0000...) pattern.
1:1	An alternating 1s and 0s pattern (binary 1010...)
1:7	A pattern of one binary 1 followed by seven binary 0s (10000000...)
3-IN-24	A 12.5% ones density pattern, synchronized to the F-bit as follows: F 0100 0100 0000 0000 0000 0100. More density patterns are available on the Density tab (see page 4–9).
63	A 2^6-1 pseudorandom bit sequence (PRBS). 63 bits long, with a maximum of five sequential zeros and six sequential ones.
511	A 2^9-1 PRBS. 511 bits long. Has a maximum of eight sequential zeros and nine sequential ones.
2047	A $2^{11}-1$ PRBS. 2047 bits long. Has a maximum of 10 sequential zeros and 11 sequential ones.
2 ¹⁵ -1 2 ²⁰ -1 2 ²³ -1	These are $2^{15}-1$, $2^{20}-1$, and $2^{23}-1$ PRBSs.
Live	Live traffic (no pattern set for receive signal; transmit signal carries QRSS pattern).
EXT	External. This selection allows you apply an external signal from the DS1 connector to the DS1 insert channel on the DS3.

DS1 Octet Patterns

The following table describes the octet-based patterns available. Note that not all of the Octet patterns are displayed on the tab at once. Tap the More... button to view additional patterns.

Pattern	Description
Oct <i>nn</i>	The Oct <i>nn</i> repeating patterns are based on <i>nn</i> number of octets. For example, Oct 52 is a 52-octet pattern, and so on.
Daly 55	The standard Daly 55-octet pattern.
Net 55	This is similar to the Daly 55 pattern, but byte 3 is 03 _h and byte 7 is 00 _h .

Density Patterns

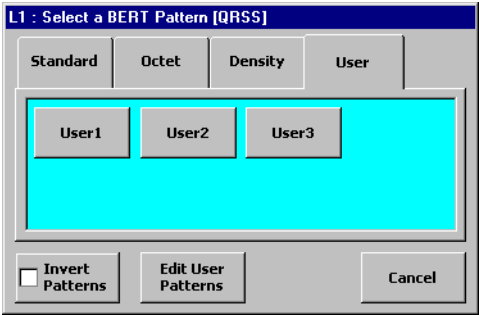
The following table describes the available density patterns. Not all of the density patterns are displayed on the tab at once. Tap the More... button to view additional patterns.

Pattern	Description
1:n	These patterns use a density of one binary 1 to n binary 0s. For example, 1:4 is one binary one for every 4 binary zeros.
2:n	These patterns use a density of two binary 1s to n binary 0s. For example, 2:10 is two binary ones for every ten binary zeros.
3-in-n	These patterns use a density of three binary 1s out of every n bits. For example, 3-in-18 is three binary 1s out of 18 bits (leaving 15 binary 0s).

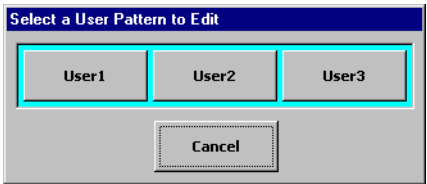
DS1 BER Test Pattern

DS1 User-Programmable Patterns

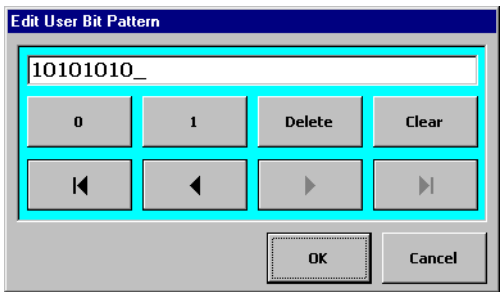
The Dual DS3/E3 Module offers three user-programmable DS1 test patterns. Selecting the User tab on the Select Pattern window displays the User Pattern category.



Tap a User button to select that pattern. To view or edit a user pattern, tap the Edit User Pattern button. This calls the Select a User Pattern to Edit window.



Tap one of the User buttons on this window to call the Edit User Pattern window.

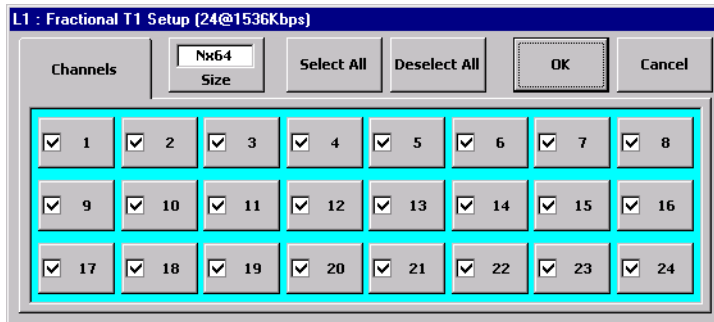


Use the buttons on the Edit Pattern window to configure the pattern. The DS1 user patterns can be set from 1 to 32 bits long.

Fractional T1 (FT1) Setup

The Dual DS3/E3 Module can perform FT1 BER testing when the Payload is set to FT1 on the Test Setup window for L1 or L2 (see *Setting Up the Test*, page 2–4). The Rate can be set to either DS3 or DS1.

When Payload is set to FT1, the FT1 setup button is active on the DS1 Setup window. Tap the FT1 button to call the Fractional T1 Setup screen.



Size: This button selects either N×64 (64 kbs) or N×56 (56 kbs) as the base channel size.

Channel buttons: The channel buttons select and deselect each channel for use in the FT1 signal. A channel button displays a check mark to indicate it is selected for inclusion in the FT1 signal. The number of selected channels and the resulting FT1 rate are shown in the title bar.

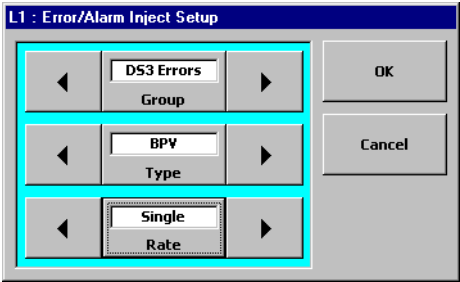
Select All button: Selects all channels for inclusion in the FT1 signal.

Deselect All button: Sets all channels to “unselected” — not included in the FT1 signal.

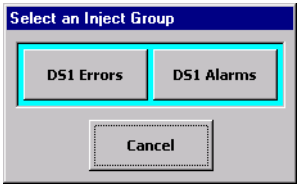
Title bar: The title bar of the Fractional T1 setup window displays the number of selected channels (N) and the resulting FT1 rate (based on the select Size; 64 or 56 kbs).

DS1 Error Injection

DS1 error injection is controlled using the Inject Setup and Inject buttons. To configure DS1 error injection tap the Inject Setup button to call the Error/Alarm Inject Setup window.



To select DS1 error or alarm injection, tap the Group button and select either DS1 Errors or DS1 Alarms.



DS1 Error/Alarm Types

To select the specific type of DS1 error or alarm to be injected, tap the Type button (or use the Type arrow buttons) to make your selection. The following table lists the available DS1 error and alarm injection types.

DS1 Error Injection Selection		
Injection Category	Injection Type	Description
DS1 Errors	BPV	DS1 bipolar violations
	Frame	DS1 framing errors
	Bit	DS1 pattern bit errors
	CRC	DS1 cyclic redundancy checksum (CRC-6) errors
	LOS	DS1 loss of signal
DS1 Alarms	OOF	DS1 out of frame
	RAI	DS1 remote alarm indication (Yellow alarm)
	AIS	DS1 alarm indication signal

DS1 Error Injection Rate

To configure the DS1 error injection rate, tap the Rate button to call the Select Inject rate window (or use the Rate arrow buttons. The injection rate can be set to one of the following:

Single: Injects one occurrence of the selected error type each time the Inject button is tapped in the Setup/Control area.

1E-n: Selects a continuous rate of injection in the format 1×10^{-n} , where n becomes the denominator. For example, 1E-3 is equivalent to 1×10^{-3} , or one error injected for every 1000 bits.

E1 Test Setup	5-2
E1 Transmit and Receive Signal Levels	5-3
E1 Framing Format	5-4
E1 Line Code	5-4
E1 Timing Source	5-5
E1 BER Test Pattern	5-6
Fractional E1 (FE1) Setup	5-10
E1 Error Injection	5-11

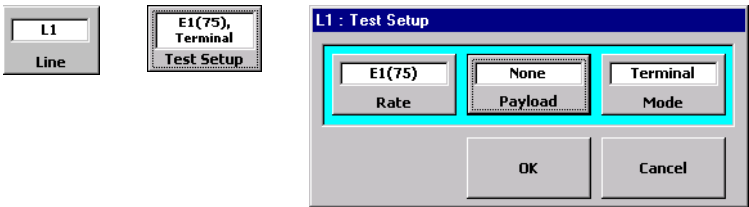
E1 Configuration Reference

E1 Test Setup

E1 Test Selection

The Dual DS3/E3 Module can test E1 signals when:

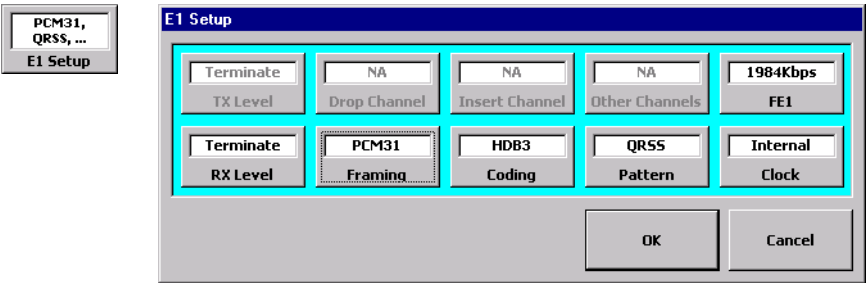
- Rate is set to E1
- Rate is set to DS3 and Payload is set to E1 or FE1 in the Test Setup window for L1 or L2 (see *Setting Up the Test*, page 2–4)



The Dual DS3/E3 Module can test E1 signals on 75 Ohm or 120 Ohm lines. If you are testing 75 Ohm E1 lines, connect the signal to the BNC or WEC0 440 jacks on the N1655B module and set Rate to E1(75). If you are testing 120 Ohm E1 lines, connect the signals to the Bantam jacks and set Rate to E1(120). See *Connecting the Module to the System Under Test*, page 2–3.

E1 Setup Window

When the Test Setup Rate or Payload is set to E1 or FE1, the E1 Setup button is displayed in the Setup/Control area. Tap this button to call the E1 Setup window.



The table on the next page lists the controls found on the E1 Setup window.

E1 Test Setup Parameters	
E1 Setup control	More information
TX Level, RX Level	See <i>E1 Transmit and Receive Signal Levels</i> , page 5–3
Framing	See <i>E1 Framing Format</i> , page 5–4
Coding	See <i>E1 Line Code</i> , page 5–4
Clock	See <i>E1 Timing Source</i> , page 5–5
Pattern	See <i>E1 BER Test Pattern</i> , page 5–6
FE1 (fractional E1)	See <i>Fractional E1 (FE1) Setup</i> , page 5–10

E1 Transmit and Receive Signal Levels

The TX Level and RX Level buttons control the signal level of the transmit and receive E1 signals.



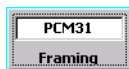
These buttons are located on the E1 Setup screen. The transmit and receive signal levels are independent for L1 and L2.

Transmit Level: The E1 TX Level button is grayed out (not active) because the E1 transmit level is fixed at the standard cross-connect level (approximately 2.37 Vpk, ± 1.2 dB).

Receive Level: The E1 RX Level button allows you to select either the standard termination level (Terminate) or E1 monitor level (Monitor).

E1 Framing Format

The Framing button on the E1 Setup window controls the framing format used on the E1 signal.



The framing is controlled independently for each line (L1 and L2). Framing can be set to any of the following:

PCM31: Provides a 31-channel E1 signal with no CRC (cyclic-redundancy check).

PCM31+CRC: Provides a 31-channel E1 signal with CRC-4.

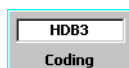
PCM30: Provides a CAS (channel associated signaling) format E1 signal. This is a 30-channel signal with no CRC (cyclic-redundancy check).

PCM30+CRC: Provides a CAS format E1 signal. This is a 30-channel signal with CRC-4.

Unframed: Provides an unframed E1 signal.

E1 Line Code

The Coding button on the E1 Setup window sets the line coding scheme used on the E1 signal. The line code is controlled independently for each line (L1/L2).



The line code can be set to either HDB3 (high-density bipolar three-zero substitution) or AMI (alternate mark inversion).

Note that the Coding button is disabled (grayed out) when the E1 signal is the payload of a DS3 signal.

E1 Timing Source

The Clock button on the E1 Setup window configures the source of the transmit timing for the E1 signal. The clock source is set independently for each line (L1 and L2).



The E1 clock source can be set to any of the following:

Internal: Timing is from the Dual DS3/E3 Module's internal clock.

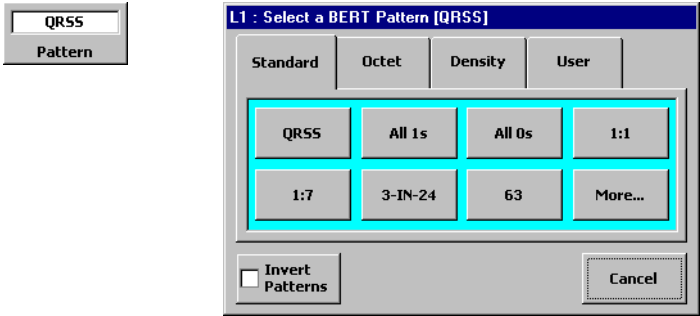
Rcv1: Timing is derived from the input E1 signal at the L1 RX BNC or WEC0 jack (E1 75 Ohm) or RX Bantam jack (E1 120 Ohm).

Rcv2: Timing is derived from the input E1 signal at the L2 RX BNC or WEC0 jack (E1 75 Ohm) or RX Bantam jack (E1 120 Ohm).

E1 BER Test Pattern

E1 BER Test Pattern

The Dual DS3/E3 Module provides a variety of test patterns for E1 BER (bit error ratio) testing. To select a pattern, tap the Pattern button on the E1 Setup window to call the Select Pattern window.



Category Tabs: Use the tabs on the Select Pattern window to select the category of pattern. Standard, Octet, Density, and User (user-programmed) patterns are available. The patterns are described on pages 5–7 to 5–9.

Pattern Inversion: Tapping the Invert Patterns button inverts all of the test patterns. Inverted patterns are displayed preceded by a slash (“/”).

E1 Standard Patterns

The following table describes the standard patterns available. Note that not all of the Standard patterns are displayed on the tab at once. Tap the More... button to view additional patterns.

E1 BER Test Patterns	
Pattern	Description
QRSS	A quasirandom signal source. This is a $2^{20}-1$ pattern with a 14-zero constraint.
All 1s	An all-ones (binary 1111...) pattern.
All 0s	An all-zeros (binary 0000...) pattern.
1:1	An alternating 1s and 0s pattern (binary 1010...)
1:7	A pattern of one binary 1 followed by seven binary 0s (10000000...)
3-IN-24	A 12.5% ones density pattern, synchronized to the F-bit as follows: F 0100 0100 0000 0000 0000 0100. More density patterns are available on the Density tab (see page 5–8).
63	A 2^6-1 pseudorandom bit sequence (PRBS). 63 bits long, with a maximum of five sequential zeros and six sequential ones.
511	A 2^9-1 PRBS. 511 bits long. Has a maximum of eight sequential zeros and nine sequential ones.
2047	A $2^{11}-1$ PRBS. 2047 bits long. Has a maximum of 10 sequential zeros and 11 sequential ones.
2 ¹⁵ -1 2 ²⁰ -1 2 ²³ -1	These are $2^{15}-1$, $2^{20}-1$, and $2^{23}-1$ PRBSs.
Live	Live traffic (no pattern set for receive signal; transmit signal carries QRSS pattern).
EXT	External. This selection allows you apply an external signal from the E1 connector to the E1 insert channel on the DS3.

E1 BER Test Pattern

E1 Octet Patterns

The following table describes the octet-based patterns available. Note that not all of the Octet patterns are displayed on the tab at once. Tap the More... button to view additional patterns.

Pattern	Description
Oct <i>nn</i>	The Oct <i>nn</i> repeating patterns are based on <i>nn</i> number of octets. For example, Oct 52 is a 52-octet pattern, and so on.
Daly 55	The standard Daly 55-octet pattern.
Net 55	This is similar to the Daly 55 pattern, but byte 3 is 03 _h and byte 7 is 00 _h .

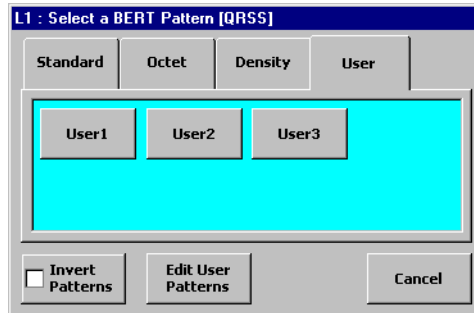
Density Patterns

The following table describes the available density patterns. Not all of the density patterns are displayed on the tab at once. Tap the More... button to view additional patterns.

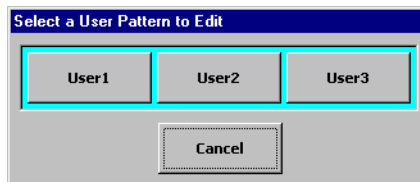
Pattern	Description
1:n	These patterns use a density of one binary 1 to n binary 0s. For example, 1:4 is one binary one for every 4 binary zeros.
2:n	These patterns use a density of two binary 1s to n binary 0s. For example, 2:10 is two binary ones for every ten binary zeros.
3-in-n	These patterns use a density of three binary 1s out of every n bits. For example, 3-in-18 is three binary 1s out of 18 bits (leaving 15 binary 0s).

E1 User-Programmable Patterns

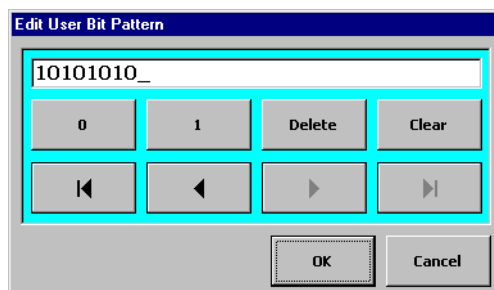
The Dual DS3/E3 Module offers three user-programmable E1 test patterns. Selecting the User tab on the Select Pattern window displays the User Pattern category.



Tap a User button to select that pattern. To view or edit a user pattern, tap the Edit User Pattern button. This calls the Select a User Pattern to Edit window.



Tap one of the User buttons on this window to call the Edit User Pattern window.

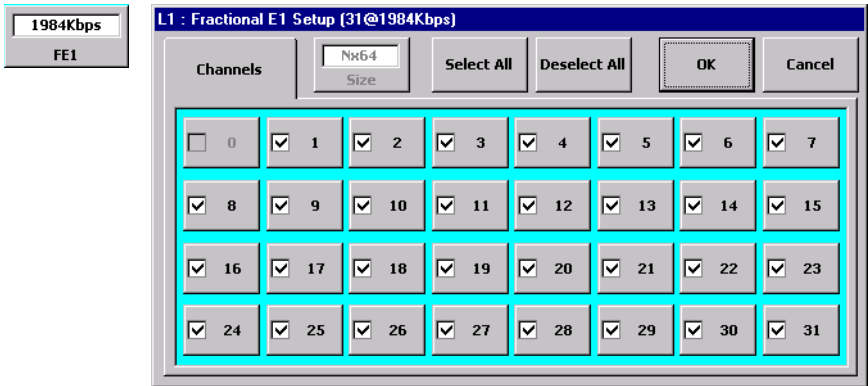


Use the buttons on the Edit Pattern window to configure the pattern. The E1 user patterns can be set from 1 to 32 bits long.

Fractional E1 (FE1) Setup

The Dual DS3/E3 Module can perform FE1 BER testing when the Payload is set to FE1 on the Test Setup window for L1 or L2 (see *Setting Up the Test*, page 2–4). The Rate can be set to either DS3 or E1.

When Payload is set to FE1, the FE1 setup button is active on the E1 Setup window. Tap the FE1 button to call the Fractional E1 Setup screen.



Size: This button is inactive (grayed out) because the FE1 base channel (timeslot) size is fixed at N×64 (64 kbs).

Timeslot buttons: The timeslot buttons select and deselect each timeslot (channel) for use in the FE1 signal. A timeslot button displays a check mark to indicate it is selected for inclusion in the FE1 signal. The number of selected timeslots and the resulting FE1 rate are shown in the title bar.

Note: If the E1 framing format is set to PCM30 or PCM30+CRC, timeslot 16 will be grayed-out (inactive). Timeslot 16 is used for multiframe alignment and signaling on 30-channel E1 signals. Timeslot 0 is always grayed-out because it is used for framing information.

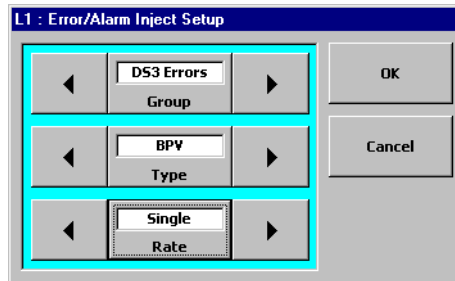
Select All button: Selects all timeslots for inclusion in the FE1 signal.

Deselect All button: Sets all timeslots to “unselected” — not included in the FE1 signal.

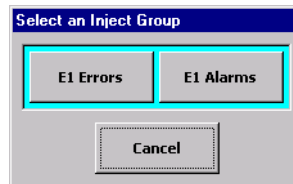
Title bar: The title bar of the Fractional E1 setup window displays the number of selected timeslots and the resulting FE1 rate.

E1 Error Injection

E1 error injection is controlled using the Inject Setup and Inject buttons. To configure E1 error injection tap the Inject Setup button to call the Error/Alarm Inject Setup window.



E1 error or alarm injection, tap the Group button and select either E1 Errors or E1 Alarms.



E1 Error/Alarm Types

To select the specific type of E1 error or alarm to be injected, tap the Type button (or use the Type arrow buttons) to make your selection. The following table lists the available E1 error and alarm injection types.

E1 Error Injection

E1 Error Injection Selection		
Injection Category	Injection Type	Description
E1 Errors	BPV	E1 bipolar violations
	Frame	E1 framing errors
	Bit	E1 pattern bit errors
	CRC	E1 cyclic redundancy checksum errors (PCM31 + CRC and PCM30 + CRC only)
E1 Alarms	LOS	E1 loss of signal
	OOF	E1 out of frame
	RAI	E1 remote alarm indication (Yellow alarm)
	AIS	E1 alarm indication signal
	RMT MFM	E1 remote multiframe alarm

E1 Error Injection Rate

To configure the E1 error injection rate, tap the Rate button to call the Select Inject rate window (or use the Rate arrow buttons. The injection rate can be set to one of the following:

Single: Injects one occurrence of the selected error type each time the Inject button is tapped in the Setup/Control area.

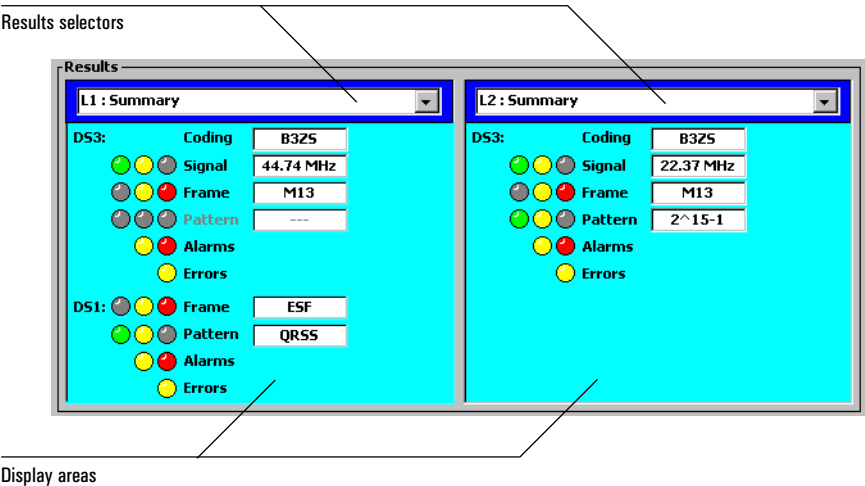
1E-n: Selects a continuous rate of injection in the format 1×10^{-n} , where n becomes the denominator. For example, 1E-3 is equivalent to 1×10^{-3} , or one error injected for every 1000 bits.

Results Display	6-2
Results Selection Window	6-3
General Summary Results Screen	6-5
General RX Signal Results Screen	6-8
General Event Log Screen	6-9
DS3 Alarms Results Screen	6-10
DS3 Errors Results Screen	6-12
DS2 Alarms Results Screen	6-14
DS2 Status Results Screen	6-15
DS1 Alarms Results Screen	6-16
DS1 Errors Results Screen	6-18
E1 Alarms Results Screen	6-20
E1 Errors Results Screen	6-22

Results Reference

Results Display

The Dual DS3/E3 Module displays test results on two side-by-side panes in the results area of the main window. Each result pane can be configured separately, allowing for flexible display of results.



Results Selector

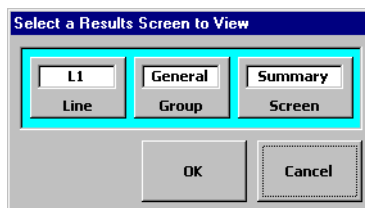
The results selector on each pane allows you to choose which measurements are displayed in that pane. Tapping a selector calls the Results Selection window (see *Results Selection Window*, page 6–3).

Display Area

The display area of each results pane shows the measurement data you have selected. The display areas change based on the selected results. Because each pane is independent, you have a lot of flexibility in selecting what is displayed. For example, you can view results from each line (L1 and L2) side-by-side to compare them. You can also view DS3 results in one pane, and view dropped DS1 results in the other pane simultaneously.

Results Selection Window

Tapping a results selector calls the Results Selection window for that pane.



The three buttons on the Results Selection window allow you to configure what is displayed on the results pane

Line: This button selects which line the measurements are from (either L1 or L2).

Group and Screen: These two buttons work together to configure which results screen is shown in the pane. Each results *group* has multiple *screens* available that show different sets of results. First tap the Group button to select a group. Next tap the Screen button to select one of the screens available for that group.

The following table lists the results groups and their associated screens. Note that not all results screen are available, depending on the setup of your test.

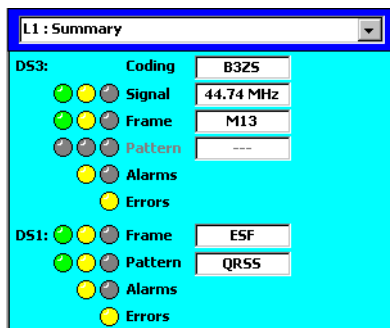
Results Selection Groups and Screens

Results Group	Available Results Screen	See also...
General	Summary	page 6-5
	RX Signal	page 6-8
	Event Log	page 6-9
DS3	Alarms	page 6-10
	Errors	page 6-12
DS2	Alarms	page 6-14
	Status	page 6-15

Results Selection Groups and Screens, continued		
Results Group	Available Results Screen	See also...
DS1	Alarms	page 6-16
	Errors	page 6-18
E1	Alarms	page 6-20
	Errors	page 6-22

General Summary Results Screen

The General Summary results screen is available for all tests. It may appear differently depending on the configuration of the test.



DS3 Summary

This section of the General Summary results screen is shown when the module is configured to test DS3. The following measurements are displayed:

Coding: Displays the DS3 line code.

Signal: The result box displays the received DS3 signal frequency. The indicators denote a valid signal (green), loss of signal (red; see *LOS*, page 6–11), and previous occurrence of LOS (yellow).

Frame: The result box displays the received DS3 framing format (C-bit or M13). The indicators denote valid framing (green), loss of frame (red; see *LOF*, page 6–11), and previous occurrence of LOF (yellow). A frame format mismatch relative to the current transmit configuration is indicated by “FFM”.

Pattern: The result box displays the transmit DS3 pattern. The indicators denote pattern synchronization (green), loss of pattern (red, see *LOP*, page 6–11), and previous occurrence of LOP. This measurement is not applicable if the DS3 is carrying subrate traffic.

Alarms: These indicators show if a DS3 alarm has been detected. See *DS3 Alarms Results Screen*, page 6–10.

Errors: This indicator comes on when an error is detected on the input DS3 signal. See *DS3 Errors Results Screen*, page 6–12.

General Summary Results Screen

DS1 Summary

This section of the General Summary results screen is shown when the module is configured to test DS1. The following measurements are displayed:

Coding: Displays the DS1 line code.

Signal: The result box displays the received DS1 signal frequency. The indicators denote a valid signal (green), loss of signal (red; see *LOS*, page 6–17), and previous occurrence of LOS (yellow).

Frame: The result box displays the transmit DS1 framing format. The indicators denote valid framing (green), loss of frame (red; see *LOF*, page 6–17), and previous occurrence of LOF (yellow).

Pattern: The results box displays the transmit DS1 pattern. The indicators denote pattern synchronization (green), loss of pattern (red; see *LOP*, page 6–17), and previous occurrence of LOP (yellow). This measurement is not applicable if the DS1 is carrying subrate traffic.

Alarms: These indicators show if a DS1 alarm has been detected. See *DS1 Alarms Results Screen*, page 6–16.

Errors: This indicator comes on when an error is detected on the input DS1 signal. See *DS1 Errors Results Screen*, page 6–18.

E1 Summary

This section of the General Summary results screen is shown when the module is configured to test E1. The following measurements are displayed:

Coding: Displays the E1 line code.

Signal: The result box displays the received E1 signal frequency. The indicators denote a valid signal (green), loss of signal (red; see *LOS*, page 6–20), and previous occurrence of LOS (yellow).

Frame: The result box displays the transmit E1 framing format. The indicators denote valid framing (green), loss of frame (red; see *LOF*, page 6–20), and previous occurrence of LOF (yellow).

Pattern: The results box displays the transmit E1 pattern. The indicators denote pattern synchronization (green), loss of pattern (red; see *LOP*, page 6–21), and previous occurrence of LOP (yellow). This measurement is not applicable if the E1 is carrying substrate traffic.

Alarms: These indicators show if a E1 alarm has been detected. See *E1 Alarms Results Screen*, page 6–20.

Errors: This indicator comes on when an error is detected on the input E1 signal. See *E1 Errors Results Screen*, page 6–22.

General RX Signal Results Screen

The General RX Signal (receive signal) results screen is available for all tests. It displays characteristics of the input signal on the selected line.

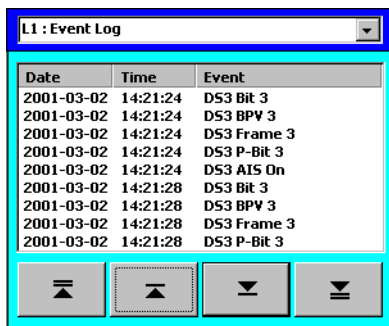
L1 : RX Signal

Frequency:	44736000 Hz
Maximum Frequency:	44736000 Hz
Minimum Frequency:	44736000 Hz
Level (Pk V):	0.67 V
Maximum Level:	0.67 V
Minimum Level:	0.67 V
Level (dbDSX):	2.84 dB
Simplex Current:	---

- Frequency:** The current received signal frequency in Hertz.
- Maximum Frequency:** The highest input signal frequency since the beginning of the test.
- Minimum Frequency:** The lowest input signal frequency since the beginning of the test.
- Level (PkV):** The input signal level peak voltage (measured in volts peak Vpk).
- Maximum Level:** The highest input signal level since the beginning of the test.
- Minimum Level:** The lowest input signal level since the beginning of the test.
- Level (dBdsx):** The current input signal level, displayed in decibels relative to the cross connect level.
- Simplex Current:** When receiving a DS1 signal, this field displays the level of DC current between the transmit and receive pairs, displayed in milliamperes (mA).

General Event Log Screen

The General Event Log results screen is available for all tests. It displays a list of all the error and alarm events that have occurred since the beginning of the test.

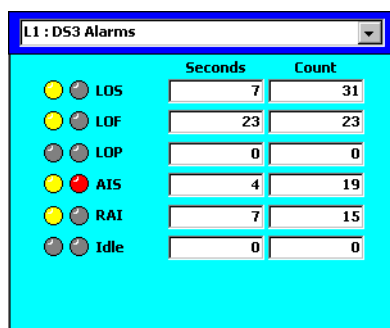














Date	Time	Event
2001-03-02	14:21:24	D53 Bit 3
2001-03-02	14:21:24	D53 BPV 3
2001-03-02	14:21:24	D53 Frame 3
2001-03-02	14:21:24	D53 P-Bit 3
2001-03-02	14:21:24	D53 AIS On
2001-03-02	14:21:28	D53 Bit 3
2001-03-02	14:21:28	D53 BPV 3
2001-03-02	14:21:28	D53 Frame 3
2001-03-02	14:21:28	D53 P-Bit 3

Each event listed on the log is dated and time stamped. If there are more events than can be displayed on the screen, the arrow keys allow you to scroll through the list.

DS3 Alarms Results Screen

The DS3 Alarm results screen is available when the signal Rate is set to DS3. This screen displays the status of DS3 alarm conditions for the selected line.



	Seconds	Count
  LOS	7	31
  LOF	23	23
  LOP	0	0
  AIS	4	19
  RAI	7	15
  Idle	0	0

Seconds and Count: The Seconds field displays the number of one-second periods during which one or more of the indicated alarms occurred. The Count field shows the total number of alarm occurrences.

Indicators: The right indicators show red when the indicated alarm condition is currently occurring. The left indicators show yellow to indicate the previous occurrence of the alarm.

Alarms: The table on the next page describes the DS3 alarms.

DS3 Alarm Definitions

DS3 Alarm	Description
LQS	Loss of signal: Declared after 128 pulse positions are received with neither a positive or negative pulse. The alarm is cleared when a pulse density greater than 33% is detected.
LOF	Loss of frame: Declared when the receiver cannot achieve either F-sync or M-sync frame synchronization. F-bit synchronization is declared lost when the number of 100% errored bit bursts exceeds 1020. M-bit synchronization is declared lost when two out of three consecutive M-groups are errored (an M-group is an M0, M1, M0 sequence; an errored M-group is an M-group that is not set to 010).
LOP	Loss of pattern: Declared when 240 bit errors out of 1024 consecutive data bits. This alarm is cleared when there are no pattern errors for 64 consecutive data bits.
AIS	Alarm indication signal: Declared when the received signal is a repeating 1010... pattern (1 following the framing bit) with valid framing and all C-bits set to 0. Signal must be present for three consecutive one-second intervals.
RAI	Remote alarm indication: also called a Yellow alarm. Indicates error conditions were detected at the far end (both X-bits are set to 0).
Idle	Idle signal: Declared when the received signal is a repeating 1100... pattern (11 following the framing bit) with valid M-frame and M-subframe alignment and P-bit parity. Also, the C-bits are set to 0 in M-subframe #3 and X-bits are both set to 1.

DS3 Errors Results Screen

The DS3 Errors results screen is available when the signal Rate is set to DS3. This screen shows various error measurements for the receive signal of the selected line.

	Count	Rate	Avg Rt	ES
Bit	0	0.0	0.0	0
BPV	0	0.0	0.0	0
Frame	0	0.0	0.0	0
REI	0	0.0	0.0	0
P-Bit	0	0.0	0.0	0
CP-Bit	0	0.0	0.0	0

The DS3 Error screen has three panels. To cycle through the panels, use the arrow buttons. You can also “turn” the table by tapping the Rotate Table button. The error types will then be listed across the top, and the error measurements listed down the side.

For each *type* of DS3 error, various *measurements* are available. The following two tables describe the DS3 error types and error measurements.

DS3 Error Definitions

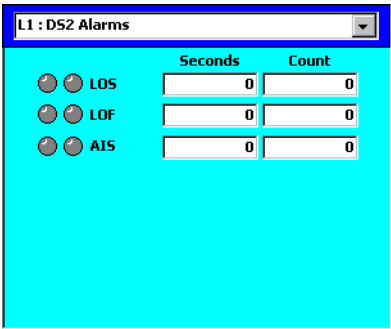
Error Type	Description
Bit	Pattern bit errors: These are errors detected in the payload test (BERT) pattern.
BPV	Bipolar violations: A BPV is the occurrence of a pulse that breaks the alternating pulse polarity rule. BPVs do not include pulses violated by zero-substitution rules.
Frame	Framing bit errors: These are errors in the F1 and F0 bits (“F-bits”).
REI	Remote error indication: These are errors detected at the far-end of the DS3.
P-Bit	P-bit parity errors: These are DS3 section parity (P-bit) errors.
CP-Bit	CP-bit parity errors: These are path parity (CP-bit) errors (C-bit parity framing format only).

DS3 Error Measurements

Measurement	Description
Count	The total number of errors since the beginning of the test.
Rate	The ratio of errored bits to the total number of bits transmitted during the previous one second.
Avg Rate	Average ratio: The ratio of errored bits to the number of bits transmitted since the beginning of the test.
ES	Errored seconds: The number of seconds during which at least one error occurred.
%ES	Percent errored seconds: The percentage of all seconds that were errored.
EFS	Error-free seconds: The number of seconds during which no errors occurred.
%EFS	Percent error-free seconds: The percentage of all seconds that were error-free.
SES	Severely errored seconds: The number of seconds in which the error ratio exceeded 10^{-3} .
%SES	Percent severely errored seconds. The percentage of all seconds that were SESs.
CSES	Consecutively errored seconds: The number of severely errored seconds (SESs) for which the previous two seconds were also SESs. This count is reset during LOS, LOF, and LOP.
UAS	Unavailable seconds: The number of seconds during which the DS3 was unavailable. The DS3 is declared unavailable after ten seconds of SES or LOP. The DS3 is declared available again after ten consecutive seconds with no SESs or LOPs.

DS2 Alarms Results Screen

The DS2 Alarms results screen is available when the rate is set for DS3 and the Payload is set for DS1 or FT1. This screen shows the status of several DS2 alarm conditions.



	Seconds	Count
LOS	0	0
LOF	0	0
AIS	0	0

LOS: DS2 loss of signal: Declared when 192 DS2 bits are received set to 0. This alarm is cleared when a single binary 1 DS2 bit is received.

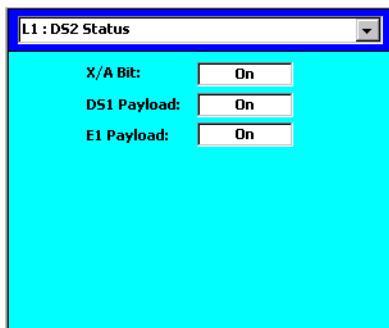
LOF: DS2 loss of frame: Declared when DS2 F-sync or M-sync is detected. Loss of DS2 F-sync is declared when three F-bits out of 15 are errored. Loss of DS2 M-sync is declared when 2 M-bit sequences out of three are errored.

This condition is cleared when DS2 F-sync or DS2 M-sync is reestablished. DS2 F-sync is established when 15 consecutive, error-free F-bits are received. DS2 M-sync is established when two consecutive, error-free M-bit sequences are received.

AIS: DS2 Alarm Indication Signal: Declared when an all-ones, unframed DS2 signal is detected (the all-ones requires a 99.9% ones density).

DS2 Status Results Screen

The DS2 Status results screen is available when the rate is set for DS3 and the Payload is set for DS1 or FT1. This screen shows the status of several DS2 signal parameters.













X/A Bit: DS2 X-bit or A-bit status: Declared when the receive X-bit (DS1-mapped DS3 signals) or A-bit (E1-mapped DS3 signals) is set to 1.

DS1 Payload: Indicates On if the DS3 signal mapping is set to DS1 (DS3 is carrying DS1 subrate traffic).

E1 Payload: Indicates On if the DS3 signal mapping is set to E1 (the DS3 is carrying E1 subrate traffic, per G.747).

DS1 Alarms Results Screen

The DS1 Alarms results screen is available when the module is configured for DS1 testing (Rate set to DS1 or Payload set to DS1 or FT1). This screen displays the status of various DS1 alarm conditions.

	Seconds	Count
  LOS	7	31
  LOF	23	23
  LOP	7	31
  AIS	4	19
  RAI	7	31

Seconds and Count: The Seconds field displays the number of one-second periods during which one or more of the indicated alarms occurred. The Count field shows the total number of alarm occurrences.

Indicators: The right indicators show red when the indicated alarm condition is currently occurring. The left indicators show yellow to indicate the previous occurrence of the alarm.

Alarms: The table on the next page describes the DS1 alarms.

DS1 Alarm Definitions

DS1 Alarm	Description
LOS	DS1 loss of signal: Declared when there are 175 or more contiguous pulse positions with no pulses. LOS is cleared when there is a 12.5% or higher ones-density on the receive signal.
LOF	DS1 loss of frame: Declared when two out of four framing bits are errored (F_t and F_s bits for SF format, FPS bits for ESF).
LOP	<p>DS1 loss of pattern: Declared when pattern synchronization is not achieved or when the receive pattern does not correspond to the internal reference pattern. Pattern synchronization is declared when 64 consecutive pattern matches (bits) are received.</p> <p>Loss of pattern synchronization is declared when 224 out of 1,024 consecutive pattern bits are errored. (User patterns with less than 25% transition density use 85 errors out of 1,024 bits.) The 1,024-bit blocks are counted from the beginning of pattern synchronization.</p>
AIS	DS1 alarm indication signal: Declared when an unframed all-ones pattern is received ("all-ones" is considered to be fewer than three zeros in two consecutive frames).
RAI	DS1 remote alarm indication. Also called a Yellow alarm: Declared when Bit 2 of at least 256 consecutive DS0 timeslots is set to 0 (SF format) <i>or</i> 16 pattern sets of 00_{h_i} and FF_{h_i} are received on the FDL (ESF format).

DS1 Errors Results Screen

The DS1 Errors results screen is available when the signal Rate is set to DS1, or the Payload is set to DS1 or FT1. This screen shows various error measurements for the receive signal of the selected line.

	Bit	BPV	Frame	CRC
Count	0	0	0	0
Rate	0.0	0.0	0.0	0.0
Avg Rt	0.0	0.0	0.0	0.0
ES	0	0	0	0
%ES	0	0	0	0
EFS	0	0	0	0
%EFS	0	0	0	0
SES	0	0	0	0
%SES	0	0	0	0
CSES	0	0	0	0
UAS	0	0	0	0

The DS1 Error screen has three panels. To cycle through the panels, use the arrow buttons. You can also “turn” the table by tapping the Rotate Table button. The error types will then be listed across the top, and the error measurements listed down the side (as shown above).

For each *type* of DS1 error, various *measurements* are available. The following two tables describe the DS1 error types and error measurements.

DS1 Error Definitionss

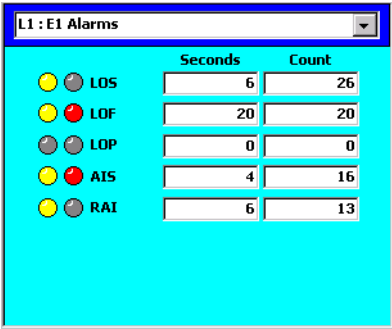
Error Type	Description
Bit	Pattern bit errors: These are errors detected in the payload test (BERT) pattern.
BPV	Bipolar violations: A BPV is the occurrence of a pulse that breaks the alternating pulse polarity rule. BPVs do not include pulses violated by zero-substitution rules.
Frame	Framing bit errors: These are errors in the framing bits (F_t and F_s bits for SF format, FPS bits for ESF).
CRC	Cyclic redundancy checksum errors: These are errors in the DS1 CRC-6 value.

DS1 Error Measurements

Measurement	Description
Count	The total number of errors since the beginning of the test.
Rate	The ratio of errored bits to the total number of bits transmitted during the previous one second.
Avg Rate	Average ratio: The ratio of errored bits to the number of bits transmitted since the beginning of the test.
SES	Severely errored seconds: The number of seconds in which the error ratio exceeded 10^{-3} .
%SES	Percent severely errored seconds. The percentage of all seconds that were SESs.
ES	Errored seconds: The number of seconds during which at least one error occurred.
%ES	Percent errored seconds: The percentage of all seconds that were errored.
EFS	Error-free seconds: The number of seconds during which no errors occurred.
%EFS	Percent error-free seconds: The percentage of all seconds that were error-free.
CSES	Consecutively errored seconds: The number of severely errored seconds (SESs) for which the previous two seconds were also SESs. This count is reset during LOS, LOF, and LOP.
UAS	Unavailable seconds: The number of seconds during which the DS1 was unavailable. The DS1 is declared unavailable after ten seconds of SES or LOP. The DS1 is declared available again after ten consecutive seconds with no SESs or LOPs.

E1 Alarms Results Screen

The E1 Alarms results screen is available when the module is configured for E1 testing (Rate set to E1 or Payload set to E1 or FE1). This screen displays the status E1 alarm conditions.



Seconds and Count: The Seconds field displays the number of one-second periods during which one or more of the indicated alarms occurred. The Count field shows the total number of alarm occurrences.

Indicators: The right indicators show red when the indicated alarm condition is currently occurring. The left indicators show yellow to indicate the previous occurrence of the alarm.

Alarms: The following table describes the E1 alarms.

E1 Alarm Definitions

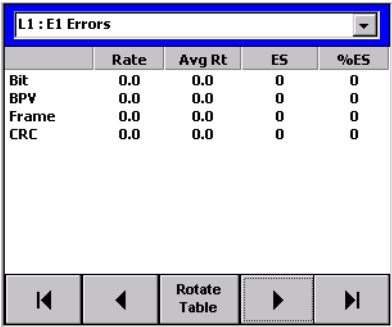
E1 Alarm	Description
LOS	E1 loss of signal: Declared when there are 175 or more contiguous pulse positions with no pulses. LOS is cleared when there is a 12.5% or higher ones-density on the receive signal.
LOF	E1 loss of frame: Declared when the frame alignment word is received errored for three consecutive frames.

E1 Alarm Definitions, continued

E1 Alarm	Description
LOP	<p>E1 loss of pattern: Declared when pattern synchronization is not achieved or when the receive pattern does not correspond to the internal reference pattern. Pattern synchronization is declared when 64 consecutive pattern matches (bits) are received.</p> <p>Loss of pattern synchronization is declared when 250 out of 1,024 consecutive pattern bits are errored. (User patterns with less than 25% transition density use 85 errors out of 1,024 bits.) The 1,024-bit blocks are counted from the beginning of pattern synchronization.</p>
AIS	E1 alarm indication signal: Declared when an unframed all-ones pattern is received ("all-ones" is considered to be fewer than three zeros in two consecutive frames).
RAI	E1 remote alarm indication: Declared when Bit 3 of the received timeslot 0 is set to 0 or set to 1 for three consecutive non-FAS frames.
LOF CRC	E1 loss of CRC-4 multiframe alignment.
LOF CAS	E1 loss of channel associated signaling multiframe alignment.
RMT MFM	E1 remote multiframe error, based on bit 6 (Y) of timeslot 16.

E1 Errors Results Screen

The E1 Errors results screen is available when the signal Rate is set to E1, or the Payload is set to E1 or FE1. This screen shows various error measurements for the receive signal of the selected line.



	Rate	Avg Rt	ES	%ES
Bit	0.0	0.0	0	0
BPV	0.0	0.0	0	0
Frame	0.0	0.0	0	0
CRC	0.0	0.0	0	0

The E1 Error screen has three panels. To cycle through the panels, use the arrow buttons. You can also “turn” the table by tapping the Rotate Table button. The error types will then be listed across the top, and the error measurements listed down the side.

For each *type* of E1 error, various *measurements* are available. The following two tables describe the DS1 error types and error measurements.

E1 Error Definitions

Error Type	Description
Bit	Pattern bit errors: These are errors detected in the payload test (BERT) pattern.
BPV	Bipolar violations: A BPV is the occurrence of a pulse that breaks the alternating pulse polarity rule. BPVs do not include pulses violated by zero-substitution rules.
Frame	Framing bit errors: These are errors in the TSO framing word or TS16 CAS framing word.
CRC	Cyclic redundancy checksum errors: These are errors in the E1 CRC-4 value.

E1 Error Measurements

Measurement	Description
Count	The total number of errors since the beginning of the test.
Rate	The ratio of errored bits to the total number of bits transmitted during the previous one second.
Avg Rate	Average ratio: The ratio of errored bits to the number of bits transmitted since the beginning of the test.
ES	Errored seconds: The number of seconds during which at least one error occurred.
%ES	Percent errored seconds: The percentage of all seconds that were errored.
EFS	Error-free seconds: The number of seconds during which no errors occurred.
%EFS	Percent error-free seconds: The percentage of all seconds that were error-free.
SES	Severely errored seconds: The number of seconds in which the error ratio exceeded 10^{-3} .
%SES	Percent severely errored seconds. The percentage of all seconds that were SESs.
CSES	Consecutively errored seconds: The number of severely errored seconds (SESs) for which the previous two seconds were also SESs. This count is reset during LOS, LOF, and LOP.
UAS	Unavailable seconds: The number of seconds during which the E1 was unavailable. The E1 is declared unavailable after ten seconds of SES or LOP. The E1 is declared available again after ten consecutive seconds with no SESs or LOPs.

About Dual DS3/E3 Module Reports	7-2
Creating a Report	7-3
Saving a Report	7-4
Opening and Deleting Saved Reports	7-5
Printing Reports	7-6
Customizing Reports	7-7

Printing and Reports

About Dual DS3/E3 Module Reports

The N1655B Dual DS3/E3 Module allows you to create, print, and save reports. These reports contain information about test configuration, test results, event log data, and other test information. Reports can be stored in the module's memory, or on a PC card inserted in the Service Advisor Tablet.

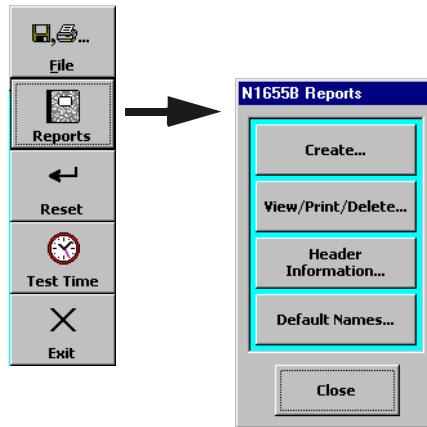
The basic procedure for generating reports is as follows:

1. Customize report headers and file names (optional). See page 7-7.
2. Create a report. See page 7-3.
3. Save the report (optional). See page 7-4.
4. Print the report (optional). See page 7-6.

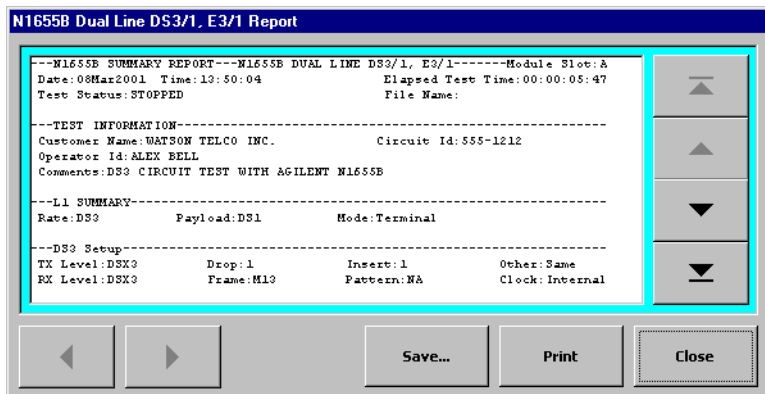
Creating a Report

This section describes how to create a report. You can create a report while a test is running or stopped. You can create a report whether or not there are any test results (for example, if you had not started a test).

1. Tap the File button to call the File menu. Next tap Reports to call the N1655B Reports window.



2. Tap the Create button to call the N1655B Reports window.

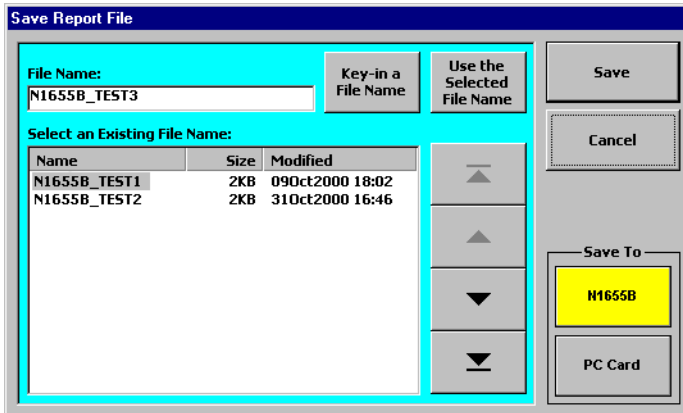


3. Use the arrow buttons to scroll through the displayed report. Tap the Save button to save the report (See page 7-4) or tap the Print button to print it (See page 7-6).

Saving a Report

When you have created a report (See page 7–3) you can save it in the Dual DS3/E3 Module’s internal memory, or in a PC card inserted in the Service Advisor Tablet.

1. Create a report. See *Creating a Report*, page 7–3.
2. On the N1655B Testing Reports window, tap the Save button. The Save Report File window is displayed.



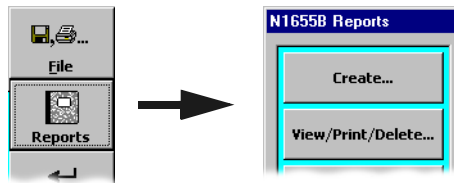
3. Select a storage destination by tapping a “Save To” button. The N1655B button stores the report in the module. The PC Card button stores the report on a PC card inserted in the Service Advisor Test Tablet.
4. Choose a filename for the report. You can choose to do one of three things:
 - Use the suggested filename shown in the File Name box.
(For information on changing the default filename, see page 7–9.)
 - Tap the Key-in a File Name button to enter your own filename.
This will open the on-screen keyboard. Tap the keys to enter the file name.
 - Use the arrow buttons to select an existing filename (if any), then tap the Use the Selected File Name button.
5. Tap the Save button to store your report.

Tap the Cancel button to close the window without saving your report.

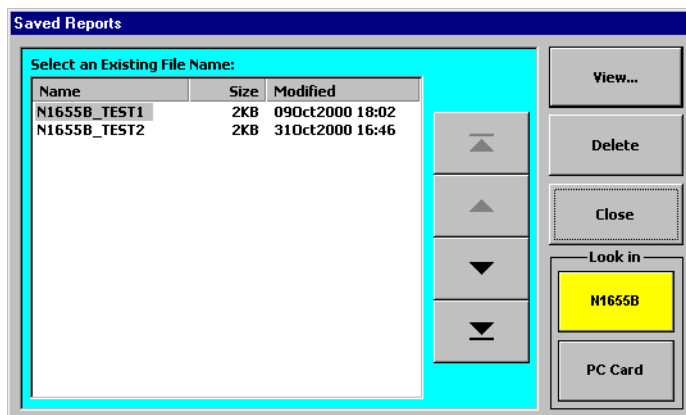
Opening and Deleting Saved Reports

This section describes how to work with reports that have been previously saved.

1. To access stored reports, tap the File button to call the File menu. Next tap Reports to call the N1655B Reports window.



2. Tap the View/Print/Delete button to call the Saved Reports window.



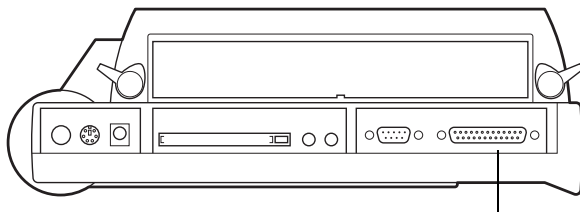
3. Use the Look In buttons to select a storage location. Tap N1655B to access reports stored in the Dual DS3/E3 Module. Tap PC Card to access reports stored on a PC card inserted in the Service Advisor Tablet.
4. Use the arrow buttons to highlight a report on the file list.
5. Tap the View button to open the stored report you selected. When the report is open you can print it by tapping the Print button.
6. Tap the Delete button to remove a report from storage. You will be prompted to confirm that you want to remove the file.

Printing Reports

You can print reports if you have a HP Deskjet™ printer connected to your Service Advisor Test Tablet or to your Internet Advisor with Service Advisor Undercradle.

Connecting a Printer

- If you are using the N1655B module in a Service Advisor Test Tablet (N1610B), use a DB-25 pin cable to connect the printer to the Tablet's parallel port.



Parallel port

- If you are using your N1655B module in a Service Advisor Undercradle (N1700A), use a DB-25 pin cable to connect the printer to the parallel port on the side of the Agilent Advisor (for example J2300D). Refer to the manual that came with your Advisor for information on connecting printers.

Printing a Report

1. After you have connected a printer to your system, create a new report or open a stored report.
 - See *Creating a Report*, page 7-3
 - See *Opening and Deleting Saved Reports*, page 7-5
2. When the report is displayed, tap the Print button to print it.

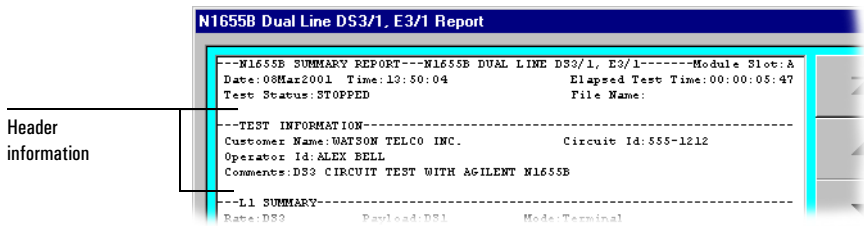
Caution: If no printer is connected, sending the Print command freezes the Service Advisor, and requires a restart. Unsaved data is lost.

Customizing Reports

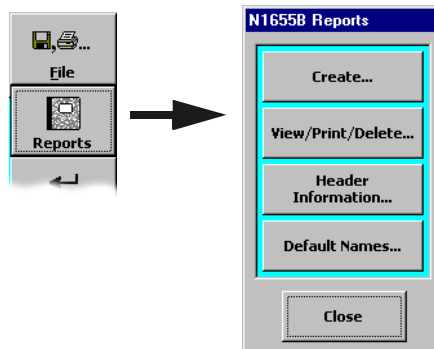
You can customize the header information on reports. You can also customize the default file names assigned to reports you are saving.

Editing Report Headers

This procedure describes how to change the test report header information.



1. Tap the File button to call the File menu. Next tap Reports to call the N1655B Reports window.



2. Tap the Header Information button. The Edit Report Header Information window is displayed.

Edit Report Header Information

Select an entry to edit:

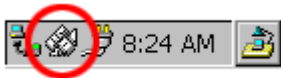
Field	Value
▶ Operator Id	Alex G. Bell
Customer Name	Telecom Co.
Circuit Id	555-1212
Comments	D53 CIRCUIT TEST WITH...

Operator Id:
Alex G. Bell

OK

Cancel

- Use the arrow buttons to select the field to edit.
- Tap the keyboard icon at the bottom of the screen in the Service Advisor Tablet task bar. The on-screen keyboard is displayed. Next tap the keys to edit the report header fields.



Esc	q	w	e	r	t	y	u	i	o	p	[]	\	7	8	9	Back
Tab	a	s	d	f	g	h	j	k	l	;	'	Enter	4	5	6	/	*
Shift	z	x	c	v	b	n	m	,	.	/	\	Caps	1	2	3	-	+
Ctrl	Win	Alt	Space				↑	↓	←	→	0	=	Enter				

Start N1610A Service Ad... 8:24 AM

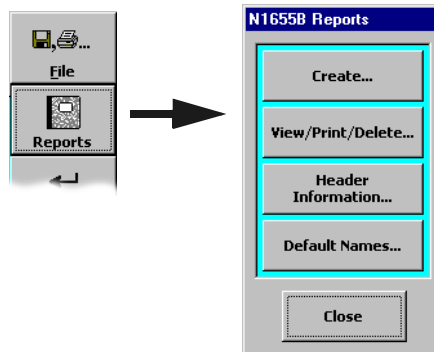
- Tap the keyboard icon again to close the keyboard when you have finished.
- Tap OK to close the window and accept your changes. Tap Cancel to close the window without making any changes to the headers.

The header information you enter is included in future reports that you create.

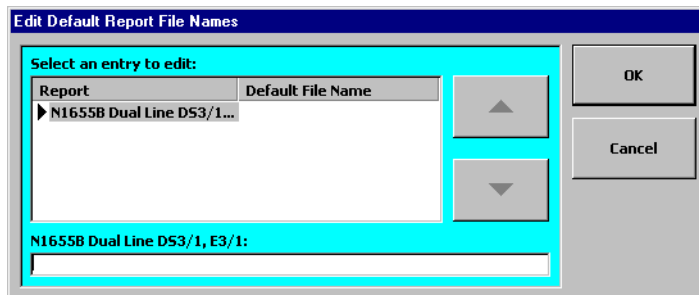
Editing Report Filenames

This procedure describes how to define the default file names used when you store reports.

1. Tap the File button to call the File menu. Next tap Reports to call the N1655B Reports window.



2. Tap the Default Names button. The Edit Default Report File Names window is displayed.



3. Use the arrow buttons to select the type of report to rename.
4. Tap the keyboard icon at the bottom of the screen in the Service Advisor Tablet task bar. The on-screen keyboard is displayed. Next tap the keys to edit the report file name (see step 4, page 7–8).
5. Tap OK to close the window and accept your changes. Tap Cancel to close the window without making any changes.

The filename you enter is used when you save a report. See *Saving a Report*, page 7–4.

Warranty, Calibration, and Service

Agilent Technologies Limited Warranty Statement

Agilent Product: N1655B Service Advisor Dual DS3/1 E3/1 Test Module

Duration of Limited Warranty: Three years

1. Agilent warrants to you, the end-user customer, that Agilent hardware, accessories and supplies will be free from defects in materials and workmanship after the date of purchase, for the period specified above. If Agilent receives notice of such defects during the warranty period, Agilent will, at its option, either repair or replace products which prove to be defective. Replacement products may be either new or equivalent in performance to new.
2. Agilent warrants to you that Agilent software will not fail to execute its programming instructions after the date of purchase, for the period specified above, due to defects in material and workmanship when properly installed and used. If Agilent receives notice of such defects during the warranty period, Agilent will replace software which does not execute its programming instructions due to such defects.
3. Agilent does not warrant that the operation of Agilent products will be uninterrupted or error free. If Agilent is unable, within a reasonable time, to repair or replace any product to a condition as warranted, you will be entitled to a refund of the purchase price upon prompt return of the product.
4. Agilent products may contain remanufactured parts equivalent to new in performance or may have been subject to incidental use.
5. Warranty does not apply to defects resulting from (a) improper or inadequate maintenance or calibration, (b) software, interfacing, parts or supplies not supplied by Agilent, (c) unauthorized modification or misuse, (d) operation outside of the published environmental specifications for the product, or (e) improper site preparation or maintenance.
6. Agilent warrants that the Agilent Product described above will be able to accurately process date data (including, but not limited to, calculating, comparing, and sequencing) from, into, and between the twentieth and twenty-first centuries, and the years 1999 and 2000, including leap year calculations, when used in accordance with the Product documentation provided by Agilent (including any instructions for installing patches or upgrades), provided that all other products (e.g. hardware, software, firmware) used in combination with such Agilent Product(s) properly exchange date data with it. If the Specifications require that specific Agilent Products must perform as a system in accordance with the foregoing

warranty, then that warranty will apply to those Agilent Products as a system, and Customer retains sole responsibility to ensure the Year 2000 readiness of its information technology and business environment. The duration of this warranty extends through January 31, 2001. To the extent permitted by local law, this warranty applies only to branded Agilent Products and not to products manufactured by others that may be sold or distributed by Agilent. The warranty in this paragraph 6) applies only to Agilent Products shipped after July 01, 1998. The remedies applicable to this paragraph 6) are those provided in paragraphs 1, 2, and 3.

7. Products purchased from Agilent outside the U.S. will receive the standard warranty in the country of purchase. If end user customer moves such Products to another country where Agilent has Support presence, then end user customer will receive the destination country standard warranty.
8. Products purchased in the U.S. based on the U.S. list prices will only receive standard warranty in the U.S., except for Products with a global warranty. A global warranty means that the Product will include the destination country's standard warranty in any country where the Product is moved provided that Agilent has Support presence in that country.
9. TO THE EXTENT ALLOWED BY LOCAL LAW, THE ABOVE WARRANTIES ARE EXCLUSIVE AND NO OTHER WARRANTY OR CONDITION, WHETHER WRITTEN OR ORAL, IS EXPRESSED OR IMPLIED AND AGILENT SPECIFICALLY DISCLAIMS ANY IMPLIED WARRANTIES OR CONDITIONS OF MERCHANTABILITY, SATISFACTORY QUALITY, AND FITNESS FOR A PARTICULAR PURPOSE. Some countries, states or provinces do not allow limitations on the duration of an implied warranty, so the above limitation or exclusion might not apply to you. This warranty gives you specific legal rights and you might also have other rights that vary from country to country, state to state, or province to province.
10. TO THE EXTENT ALLOWED BY LOCAL LAW, THE REMEDIES IN THIS WARRANTY STATEMENT ARE YOUR SOLE AND EXCLUSIVE REMEDIES. EXCEPT AS INDICATED ABOVE, IN NO EVENT WILL AGILENT OR ITS SUPPLIERS BE LIABLE FOR LOSS OF DATA OR FOR DIRECT, SPECIAL, INCIDENTAL, CONSEQUENTIAL (INCLUDING LOST PROFIT OR DATA), OR OTHER DAMAGE, WHETHER BASED IN CONTRACT, TORT, OR OTHERWISE. Some countries, states or provinces do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you.

THE WARRANTY TERMS CONTAINED IN THIS STATEMENT, EXCEPT TO THE EXTENT LAWFULLY PERMITTED, DO NOT EXCLUDE, RESTRICT OR MODIFY AND ARE IN ADDITION TO THE MANDATORY STATUTORY RIGHTS APPLICABLE TO THE SALE OF THIS PRODUCT TO YOU.

Support

If you have a question or need help with your N1655B Dual DS3/E3 Test Module, please refer to one of the following sources of assistance.

- Read this manual to see if the information you seek is here. To help you locate information more quickly, use the Index at the back of the manual, and the Table of Contents at the front of the manual.
- Carefully check your test setup, connections, and power. Be sure that the module is installed in the Service Advisor tablet properly.
- Refer to the Agilent Technologies website at <http://www.agilent.com>
- Call the Agilent Call Center at 800-452-4844.

Calibration and Service

Calibration

This instrument must be calibrated only by authorized Agilent Technologies personnel. Unauthorized service or calibration will void the warranty.

- Agilent Technologies suggests that the Dual DS3/E3 Test Module (N1655B) be calibrated every three years.

To arrange for calibration, please contact the Agilent Instrument Support Center at 800-403-0801 to obtain an RMA (return material authorization) number and receive shipping instructions.

Service

If your Dual DS3/E3 module is not operating properly, carefully check all configuration parameters and connections. Improper selection of timing modes or drop channels, for example, can cause unexpected operation. Also check that the module is seated properly in the Tablet or Undercradle.

If you are still experiencing problems or feel that your module requires service, contact the Agilent Call Center at 800-452-4844. Trained personnel are available to help solve your problem or determine if the module must be returned for repair.

If your module must be returned, a Call Center representative will assign an RMA (return material authorization) number and give you shipping instructions. No product will be accepted for service without an RMA number.

Contact the Instrument Support Center at 800-403-0801.

AB/ABCD: Signaling bits for DS0 and TS channels.

ac: Alternating current.

AIS: Alarm indication signal. Originally called a “Blue” alarm.

ALBO: Automatic line build out.

all-ones: A bit pattern made up entirely of binary 1s.

AMI: Alternate Mark Inversion. A line coding scheme.

ANSI: American National Standards Institute.

asynchronous: Not synchronized; not timed to an outside clock source.

bandwidth: A network or channel’s capacity to carry traffic.

BER: Bit error rate. Percentage of bits with errors in total bits received.

BERT: Bit error rate test (or testing).

B-ISDN: Broadband ISDN. See also *ISDN*.

bit: A basic unit of data. A bit can be set to either a zero or a one.

bit rate: (FTP) The speed at which bits are transferred over the network.

BITS: Building integrated timing supply. A stratum 1 clock source, typically in a CO.

Blue alarm: See *AIS*.

B n ZS: Bipolar with n -zero substitution. A line coding scheme in which n consecutive zeros are replaced by a substitution code to maintain a high pulse density. Typical codes are B3ZS for DS3 and B8ZS for DS1.

BPV: Bipolar violation. The occurrence of a pulse that breaks the alternating polarity rule

Bridged tap: Unconnected cables on a reconditioned line, a common cause of problems with digital services.

BW: See *bandwidth*.

byte: Eight bits. Usually refers to a particular location in a frame.

C-bit: The third, fifth, and seventh overhead bits in a DS3 signal’s M-subframes.

C-bit parity format: A DS3 framing format.

CAS: Channel associated signaling.

CCITT: Consultative Committee on International Telegraph and Telephone, now the International Telecommunications Union (ITU). The standards produced by this organization are called ITU-T Recommendations.

clock: The timing of, or timing source for, digital telecom equipment.

clock rate: Pulses per second emitted by a computer clock.

CMI: Code mark inversion. A line coding scheme.

COFA: Change of frame alignment. A shift in the alignment of a signal's framing bits.

CP-bit: The third, fifth, and seventh overhead bits in the third M-subframe of a C-bit parity formatted DS3 signal.

CRC: Cyclic redundancy checksum. A basic error-checking technique.

CSES: Consecutively severely errored second.

CTS: Clear to send.

CV: Code violation.

D4: See *SF*.

Daly pattern: A repeating 55 octet pattern.

datalink: A transmission path for data.

dB: Decibel. Standard unit for transmission loss, gain, and relative power ratios.

dBdsx: Decibels relative to the DSX level.

dBm: Decibels relative to one milliwatt.

dc: Direct current.

DCE: Data circuit terminating equipment. Equipment that provides the interface between a DTE device and a transmission circuit (for example, a modem).

DCC: Data communications channel.

DCE: Data circuit-terminating equipment. Equipment that provides the interface between a DTE device and a transmission circuit. For example, a modem.

decimal: A base-10 numbering system in which the digits range from 0 to 9.

DRS: Digital reference signal.

DS0: Digital signal level 0; typically 64 or 56 kb/s.

DS1: Digital signal level 1; 1.544 Mbps.

DS2: Digital signal level 2; 6.312 Mbs

DS3: Digital signal level 3; 44.736 Mbs.

DSX: A digital signal cross-connect and patch bay.

DTE: Data terminal equipment. Equipment that converts user information into data signals for transmission (for example, a PC).

E1: A CCITT digital signal of 2.048 Mbs.

EFS: Error-free second.

EIA: Electronics Industry Association

error rate: The number of errors per second. Compare *error ratio*.

error ratio: The number of errors over the total number of bits. This term is often used interchangeably with *error rate*, although they are two different measurements.

ES: Errored second. A second in which at least one error occurred.

ESD: Electrostatic discharge. The discharge of static electricity, which has the potential to damage electronic circuitry.

ESF: Extended Superframe framing format (DS1).

F-bit: Framing bit.

FAS: Frame alignment signal.

FE1: Fractional E1. A subrate signal on an E1, comprising N number of timeslots (channels). See also $N \times 64$.

FEAC: Far-end alarm and control. The FEAC channel uses the third C-bit to carry alarm and control information.

FEBE: Far-end block error.

FERF: Far-end receive failure.

FFCV: Frame format coding violation.

FFM: Frame format mismatch.

frame: A group of bits, timeslots, or bytes whose unique positions can be identified relative an alignment signal or pointer.

FT1: Fractional T1. A subrate signal on a DS1, comprising N number of DS0 channels. See also $N \times 64$.

GUI: Graphical user interface.

hexadecimal: A base-16 numbering system in which the digits range from 0 through F. A subscript “h” is used to denote a hexadecimal value (for example, 2A0F_h).

HDB3: High-density bipolar with three-zero substitution. A line coding scheme.

HSI: High speed serial interface. Uses a SCSI-2 50-pin connector.

Hz: Hertz. Measure of frequency, one cycle per second.

idle signal: A signal transmitted to indicate that a channel is not in use.

IP: Internet Protocol.

ISDN: Integrated Services Digital Network.

ISO: International Standards Organization.

ITU: International Telecommunications Union, formerly the Consultative Committee on International Telegraph and Telephone (CCITT). The standards produced by this organization are called ITU-T Recommendations.

jitter: Short-term variation in the phase of a digital signal (includes phase variation above 10 Hz).

Kb or Kbit: Kilobit. A thousand bits.

KB or Kbyte: Kilobyte. One thousand bytes.

Kbs: Kilobits per second.

kHz: Kilohertz. Measure of frequency, one thousand cycles per second.

LAN: Local area network.

LBO: See *line build-out*.

LCD: Liquid Crystal Display.

LCVA: Line code violation alarm.

LCVR: Line code violation rate.

LED: Light-emitting diode.

line: In a network, the part of the *path* between two consecutive line terminating network elements.

line build-out: A circuit that simulates the signal attenuation of a specified cable length.

line identifier: A FEAC bit sequence that indicates which DS3 or DS1 line is to be affected by a loopback command.

LOF: Loss of frame.

loopback: A state in which the transmit signal is reversed back as the receive signal, typically by a far-end network element.

LOS: Loss of signal.

mA: Milliampere. Measure of current, one thousandth of an ampere.

M-bit: M-subframe framing bit. Bit 1 of the fifth, sixth, and seventh M-subframes in a DS3 signal.

M13: A DS3 framing format, or the multiplex between the DS1 and DS3 levels.

Mb or Mbit: Megabit. One million bits.

MB or Mbyte: Megabyte. One million bytes.

MBLT: Mobile both-line terminal framing format.

Mbs: Megabits per second. One megabit equals one million bits.

M-frame: See *multiframe*.

MFA: Multiframe alignment. See *multiframe*.

MHz: Megahertz. Measure of frequency, one million cycles per second.

monitor level: The signal level at a DSX Monitor point.

ms: Millisecond. One thousandth of a second.

multiframe: A set of consecutive frames in which the position of each is defined in relation to a multiframe alignment signal.

N × 64/N × 56: A subrate signal on a DS1 or E1 formed by using N number of 64 kbs or 56 kbs channels.

NiMH: Nickel Metal Hydride. A type of rechargeable battery.

NIU: Network interface unit.

NNI: Network–network interface. The demarcation point between two networks.

node: Any addressable device in the network, such as a host.

O-bit: DS3 overhead communication channel bits.

octet: Eight bits. Typically refers to a group of bits that spans more than one byte. Compare *byte*.

OH: See *overhead*.

OOF: Out of frame.

orderwire: A voice or data circuit used for maintenance purposes.

overhead: The bits or bytes in a frame or cell that are not the payload. Overhead provides for signal control and monitoring.

P-bit: Parity bit. The P-bit channel of a DS3 comprises the P1 and P2 bits of the M-frame and provides parity information for the preceding M-frame.

packet: A block of serial data. identified by a header and end byte.

parity: An error checking method that uses extra bits to provide even or odd parity for a specific group of bits.

path: In a network, the connection between the point where the frame for a signal is assembled, and the point where it is disassembled.

payload: The information bits of a frame or cell. Those bits that are not part of the *overhead*.

PDH: Plesiochronous digital hierarchy

PING: Packet InterNet Groper. Also, the act of transmitting a PING to another device.

ppm: Parts per million.

PRBS: Pseudorandom bit sequence. A test pattern that simulates live, random traffic.

QRSS: Quasirandom sequence signal.

RAI: Remote alarm indication.

RAM: Random access memory.

RDI: Remote defect indication.

ROM: Read-only memory.

SCPI: Standard Commands for Programmable Instruments.

SCSI: Small Computer Serial Interface

SDH: Synchronous digital hierarchy.

section: The part of a network *path* between a terminal network element and a regenerator, or between two regenerators.

SEE: Severely errored event.

SF: Superframe format. DS1 framing format.

SLC-96™: Subscriber loop carrier system 96. An AT&T T1 framing format.

SONET: Synchronous optical network.

STS-1: The basic synchronous transport signal. A 125 μ s frame (51.840 Mbs).

STS-N: Synchronous transport signal N, where N indicates the number of STS-1s interleaved to generate the signal.

STS-Nc: Concatenated STS signal. An STS-N in which the payloads are grouped to carry a super rate signal.

sub-multiframe: A division of a multiframe that also contains multiple frames. Also called an M-subframe.

synchronous: Synchronized. Occurring at the same rate or period; sharing common timing with an outside timing source.

T1: See *DS1*.

TDR: Time Domain Reflectometer.

timeslot: A unique, cyclic time interval; typically providing a single channel.

timing: See *clock*.

TLP: Transmission Level Point.

TS: See *timeslot*.

TS0: Timeslot zero. The first timeslot in an E1 frame.

TS16: Timeslot sixteen. The 17th timeslot in an E1 signal, used to provide channel associated signaling.

TTL: Transistor to transistor logic. A standard transmission level with a logic low of 0 volts and a logic high of 5 volts.

UAS: Unavailable seconds.

UI: Unit interval. The duration of one clock cycle, or pulse period, for a given rate.

UNI: User-Network Interface. The demarcation point between the customer premise and the network.

V: Volt.

Vac: Volt, alternating current.

Vdc: Volt, direct current.

VF: Voice frequency.

V pk: Volt peak.

V p-p: Volt, peak-to-peak.

X-bit: The first overhead bit in the first and second M-subframes of a DS3 M-frame.

xDSL: Digital subscriber line.

Yellow alarm: (DS1) Also called a remote alarm or RAI, this alarm indicates a near-to-far transmission failure.

μsec: Microsecond. One-millionth of a second.

%EFS

- E1 error 6-22
- E1 error meas. 6-23

%ES

- DS1 error meas 6-19
- DS3 error meas. 6-13
- E1 error 6-22
- E1 error meas. 6-23

%SES

- DS1 error meas 6-19
- DS3 error meas. 6-13
- E1 error 6-22
- E1 error meas. 6-23

1:1, E1 BER test pattern 5-7

1:n, E1 density pattern 5-8

3-in-24

- DS1 BER test pattern 4-8
- E1 BER test pattern 5-7

A

Agilent Technologies

- call center (800-452-4844) W-4
- limited warranty W-2

AIS 4-12, 5-11, 6-14

- DS1 alarm 6-17
- DS1 error 4-13
- DS3 alarm 3-11, 6-11
- E1 alarm 5-12, 6-20

alarms 3-10, 4-12, 5-11, 6-3, 6-5, 6-6, 6-7

all 0s

- DS1 BER test pattern 4-8
- DS3 BER test pattern 3-4
- E1 BER test pattern 5-7

all 1s

- DS1 BER test pattern 4-8
- DS3 BER test pattern 3-4
- E1 BER test pattern 5-7

AMI 4-5, 5-4

ANSI Gloss-7

asynchronous Gloss-7

Auto Setup 1-5

Auto Start 1-7

B

B8ZS 4-5

BERT Gloss-7

BERT pattern 3-4, 4-7, 5-6

Bit

- DS1 error 4-13, 6-18
- DS3 error 3-11, 6-12
- E1 error 5-12, 6-22

bit errors 4-12, 5-11

BNC connectors 1-3, 2-3

BPV 3-10, 4-12, 5-11

- DS1 error 4-13, 6-18
- DS3 error 3-11, 6-12
- E1 error 5-12, 6-22

C

calibration and service W-5

call center W-4

C-Bit 3-3

CCITT Gloss-7

channel size 2-9, 4-11, 5-10

clock 2-5, 2-8, 3-7, 4-6, 5-5

clock rate Gloss-7

coding 2-8, 4-5, 5-4, 6-5, 6-6, 6-7

- configuring DS1 parameters 2-8
- configuring DS3 parameters 2-5
- connect a printer 7-6
- connectors 1-2, 1-3, 2-3
- count
 - DS1 error meas. 6-19
 - DS3 error meas. 6-13
 - E1 error 6-22
 - E1 error meas. 6-23
- CP-Bit, DS3 error 3-11, 6-12
- CRC 4-12, 5-11
 - DS1 error 4-13, 6-18
 - E1 error 5-12, 6-22
- creating reports 7-3
- CSES
 - DS1 error meas 6-19
 - DS3 error meas. 6-13
 - E1 error 6-22
 - E1 error meas. 6-23

D

- Daly
 - DS1 octet pattern 4-9
 - E1 octet pattern 5-8
- declaration of conformity iv
- defaults 1-8
- defaults, restoring 1-8
- delete a report 7-5
- density patterns 4-9, 5-8
- deselect all 4-11, 5-10
- display area 6-2
- drop/insert 2-9, 3-8
- drop channel 2-6, 2-9, 3-8

- DS1 Gloss-8
 - alarms 4-12, 4-13, 6-17
 - BER test patterns 4-8
 - density patterns 4-9
 - drop/insert 2-9
 - error injection 4-12
 - error measurements 6-19
 - errors 4-13, 6-18
 - frame format 4-5
 - jacks 2-3
 - line code 4-5
 - octet patterns 4-9
 - pattern 4-7
 - signal levels 4-4
 - standard patterns 4-8
 - test setup 4-2
 - timing source 4-6
 - user-programmable patterns 4-10

- DS1 results
 - alarms 6-16
 - errors 6-18
 - summary 6-6

- DS1 setup 2-8

- DS2 alarms 6-14

- DS2 status results screen 6-15

- DS3
 - alarms 3-10, 6-11
 - alarm types 3-11
 - BER test patterns 3-4
 - drop/insert 2-6, 3-8
 - error injection 3-10, 3-11
 - error measurements 6-13
 - errors 6-12
 - error types 3-11
 - frame format 3-3
 - jacks 2-3
 - pattern 3-4
 - signal levels 3-3
 - standard patterns 3-4
 - test setup 3-2
 - timing source 3-7
 - user-programmable patterns 3-5

DS3 results

- alarms screen 6-10
- errors 6-12
- summary 6-5

DS3 setup 2-5

DSX1 4-4

DTE Gloss-8

DTMF Gloss-8

E

E1

- alarms 5-11, 5-12, 6-20
- BER test patterns 5-7
- density patterns 5-8
- error injection 5-11
- errormeasurements 6-23
- errors 5-12, 6-22
- frame format 5-4
- line code 5-4
- octet patterns 5-8
- pattern 5-6
- signal levels 5-3
- standard patterns 5-7
- test setup 5-2
- timing source 5-5
- user-programmable patterns 5-9

E1 jacks 2-3

E1 payload 6-15

E1 results

- alarms 6-20
- errors 6-22
- summary 6-7

E3 jacks 2-3

edit pattern 3-5, 4-10, 5-9

EFS

- DS1 error meas 6-19
- DS3 error meas. 6-13
- E1 error 6-22
- E1 error meas. 6-23

ERR (error) 1-4

error group 2-13

error injection 2-13, 3-10, 3-11, 4-12, 5-11

error injection rate 3-11, 4-13, 5-12

error rate 2-13, 6-13

errors 3-10, 6-3, 6-5, 6-6, 6-7

error type 2-13

ES

- DS1 error meas 6-19
- DS3 error meas. 6-13
- E1 error 6-22
- E1 error meas. 6-23

event log 6-3, 6-9

EXT

- DS1 BER test pattern 4-8
- E1 BER test pattern 5-7

F

factory defaults 1-8

FE1 5-10

FFM 6-5

File 1-5

filename, report 7-9

fractional E1 setup 5-10

fractional T1 setup 4-11

frame

- DS1 error 4-13, 6-18
- DS3 error 3-11, 6-12
- E1 error 5-12, 6-22

frame format 2-5, 2-8, 3-3, 4-5, 5-4, 6-5, 6-6, 6-7

framing 3-3

frequency 6-8

FRM (frame) 1-4

FT1 4-11

G

G.747 6-15
general event log screen 6-9
general summary 6-5
group 2-13, 6-3
group (results) 2-15

H

HDB3 5-4
headers, report 7-7
Help 1-5
HIST (history) 1-4
Hz Gloss-9

I

Idle, DS3 alarm 3-11, 6-11
IMD Gloss-9
indicators 1-2, 1-4
inject 2-13
injection rate 4-13, 5-12
insert channel 2-6, 2-9, 3-8
install module 1-7
invert pattern 3-4
ISDN Gloss-9
ISO Gloss-9
ITU Gloss-9

J

jacks 1-3, 2-3

K

keyboard 7-8
kHz Gloss-9

L

L1 & L2 1-3, 2-3, 2-15
LBO 4-4
level 6-8
line code 2-8, 4-5, 5-4
line connectors 1-3
live
 DS1 BER test pattern 4-8
 DS3 BER test pattern 3-4
 E1 BER test pattern 5-7
LOF 6-14
 DS1 alarm 6-17
 DS3 alarm 6-11
 E1 alarm 6-20
LOF CAS, E1 alarm 6-20
LOF CRC, E1 alarm 6-20
LOP
 DS1 alarm 6-17
 DS3 alarm 6-11
 E1 alarm 6-20
LOS 3-10, 6-14
 DS1 alarm 6-17
 DS1 error 4-13
 DS3 alarm 3-11, 6-11
 E1 alarm 5-12, 6-20

M

M12 loopback 6-15
M13 3-3
mA Gloss-10
main screen 1-5
maximum frequency 6-8
MHz Gloss-10
minimum frequency 6-8
mode 2-4

module
 at a glance 1-2
 connectors 1-3
 indicators 1-4
 module bays 1-7
 monitor 4-4
 ms Gloss-10

N

Net 55
 DS1 octet pattern 4-9
 E1 octet pattern 5-8
 NEXT Gloss-10

O

octet patterns 4-9, 5-8
 on-screen keyboard 7-8
 OOF 3-10, 4-12, 5-11
 DS1 error 4-13
 DS3 alarm 3-11
 E1 alarm 5-12
 open a report 7-5
 option 001 (BNC) 1-3
 option 002 (WEC0 440) 1-3
 other channels 2-6, 2-9, 3-8

P

PATT (pattern) 1-4
 pattern 2-5, 2-8, 3-4, 4-7, 5-6, 6-5, 6-6, 6-7
 patterns
 density 4-9, 5-8
 octet 4-9, 5-8
 standard 3-4, 4-8, 5-7
 user-programmable 3-5, 4-10, 5-9
 payload 2-4
 P-Bit, DS3 error 3-11, 6-12
 PkV 6-8

POTS Gloss-11
 print
 connect a printer 7-6
 reports 7-6

Q

QRSS
 DS1 BER test pattern 4-8
 E1 BER test pattern 5-7

R

RAI 3-10, 4-12, 5-11
 DS1 alarm 6-17
 DS1 error 4-13
 DS3 alarm 3-11, 6-11
 E1 alarm 5-12, 6-20
 rate 2-4
 DS1 error meas 6-19
 DS3 error meas. 6-13
 E1 error 6-22
 E1 error meas. 6-23
 rate (error rate) 2-13
 Rcv1/Rcv2 3-7, 4-6, 5-5
 RDY (ready) 1-4
 REI 3-10
 DS3 error 3-11, 6-12
 reports 7-2 to 7-9
 create 7-3
 customize 7-7
 delete 7-5
 filename 7-9
 headers 7-7
 open 7-5
 printing 7-6
 save 7-4
 restore
 factory defaults 1-8
 restoring defaults 1-8

- results 2-15, 6-2
 - DS1 alarms 6-16
 - DS1 errors 6-18
 - DS1 summary 6-6
 - DS2 alarms 6-14
 - DS2 status 6-15
 - DS3 alarms 6-10
 - DS3 errors 6-12
 - DS3 summary 6-5
 - E1 alarms 6-20
 - E1 errors 6-22
 - E1 summary 6-7
 - event log 6-9
 - general RX signal 6-8
 - general summary 6-5
 - group 2-15, 6-3
 - screen 2-15, 6-3
 - selection 6-3
 - selector 6-2
- results display area 1-6, 6-2
- RMT MFM, E1 alarm 5-12, 6-20
- RX jack 1-3
- RX level 2-8, 3-3, 4-4, 5-3
- RX signal results 6-8

S

- saving reports 7-4
- SCPI Gloss-11
- screen (results) 2-15, 6-3
- select all 4-11, 5-10
- select channels 2-9
- select interface 2-4
- service and calibration W-5
- SES
 - DS1 error meas 6-19
 - DS3 error meas. 6-13
 - E1 error 6-22
 - E1 error meas. 6-23
- setting up the test 2-4

- setup control area 1-6
- SIG (signal) 1-4
- signal 6-5, 6-6, 6-7
- signal connection 2-3
- signal connectors 1-3
- simplex current 6-8
- size 2-9
- Slot A/Slot B 1-5
- standard patterns (DS1) 4-8
- standard patterns (DS3) 3-4
- standard patterns (E1) 5-7
- start/stop 1-5, 2-14
- starting the test 2-14
- support W-4
- switch on 1-7
- synchronous Gloss-11

T

- testing overview 2-2
- test pattern 4-7, 5-6
- test setup 2-4, 3-2, 4-2, 5-2
- test start/stop 1-5, 2-14
- test time 2-14
- time mode 2-14
- timing 2-5, 2-8, 3-7, 4-6, 5-5
- toolbar 1-5
- trouble scan 1-5
- TTL Gloss-12
- TX jack 1-3
- TX level 2-5, 2-8, 3-3, 4-4, 5-3
- type 2-13
- typing 7-8

U

UAS

DS1 error meas 6-19

DS3 error meas. 6-13

E1 error 6-22

E1 error meas. 6-23

user-programmable patterns 3-5,
4-10, 5-9

V

Vac Gloss-12

viewing results 2-15

Vpk 6-8

W

warranty W-2

WEC0 440 connectors 2-3

WEC0 440 connectors 1-3

X

X/A Bits 6-15

xDSL Gloss-12

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